THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXXV., No. 14. Whole No. 1,634. | NEW YORK, MONDAY, OCTOBER 1, 1906. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
First Annual Meeting, American Gas Institute..... 577
EDITORIALS—
Briefly Told..... 578
The Fourteenth Annual Meeting of the Michizan Gas Association—Mr. Ralph Woodward Retires from Active Service—Death of Mr. W. P. Fodell—Notes.
*The Removal of Naphthaline From Coal Gas—Third Paper, by Messrs A. H. White and J. M. Barnes..... 579
*Regarding the Flywheel of the Gas Engine, by "R."..... 585
*The Busey Babbitt Melter..... 586
A Dust Preventer for Public Roads, by Mr. W. Lister..... 587
The Supply of Gasoline..... 588
Coal Tar Paint..... 589
The Question of Advertising Charge to Secure New Business..... 589
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 590
Mr. J. C. Krouse Succeeds the Late Mr J. T. Ford—Annual Meeting, Holland, Mich.—An Illustrated Lecture—Something from Elmira, N. Y.—Gas for Atlantic Highlands, N. J.—Gas Works for Abilene Tex.—Mr. B. H. Spangenberg's New Field—Death of Mr. F. W. Shubert—Am. Public Works Association—Death of Mr. John F. Eagan—Balloon Gas Pittsfield Mass.—Obituary Record, Judge T. H. Malone—New Stock, Lawrence (Mass.) Company—Gas Plant for Iron Mountain, Mich.—Annual Meeting St. Joseph, Mo.—Personal—Mr. C. F. Cattell is Busy—A Handsome Office Building—Cheaper Gas for Kingston, N. Y.—And Other Items.
The Market for Gas Securities..... 592

[OFFICIAL NOTICE.]

First Annual Meeting, American Gas Institute.

AMERICAN GAS INSTITUTE,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 24, 1906.

The first annual meeting of the American Gas Institute, composed of the merger of the Ohio, the American and Western Gas Associations, will be held in the Auditorium Hotel, Chicago, Ills., Oct. 17th, 18th and 19th, 1906, and will be called to order by Mr. B. W. Perkins, Altoona, Pa., President of the Ohio Gas Association, who has been selected as presiding officer.

The Auditorium Hotel offers rates to delegates as follows:

Single rooms	$2.00 per day and up.
Two in a room	3.00 per day and up.
Single room with bath	3.50 per day and up.
Double, or two in a room with bath	5.00 per day and up.

Those expecting to attend the Convention are requested to secure rooms in advance of the meeting.

The following Passenger Associations have granted reduced rates on the certificate plan of 1½ fare for the round trip, plus 25 cents for each railroad certificate vised by the representative of the Passenger Associations, who will indorse the certificates: Central Passenger Association, Western Passenger Association, Trunk Line Association, Eastern Canadian Passenger Association, South Western Passenger Association, South Eastern Passenger Association, New England Passenger Association, excepting the Eastern Steamship Company.

These Associations include all the territory of the United States and Canada. All persons purchasing tickets for Chicago should appear at the railway station at least 30 minutes before departure of train, purchasing from agent a first-class ticket to Chicago, paying full fare for the same, and receive from the agent a certificate stating that he has purchased a first-class ticket to attend the meeting of the American Gas Institute. This certificate must be filed with the Secretary in Chicago during the meeting. After it has been properly indorsed it will enable you to purchase a ticket, returning to starting point for one-third the usual rate.

Membership blanks have been sent to all of the members of the three above Associations.

It is requested that members avail themselves of the opportunity to become charter members at the very earliest moment, insomuch as 60 days has been decided as the limit for acceptance.

Acknowledgments of the receipts of applications have been mailed to all of those who have forwarded their application to the Acting Secretary. Failure to receive such acknowledgment is indicative that your application for membership has not been received. The Acting Secretary urges upon every person, who wishes to become a charter member, that they lose no time in sending in their application. The qualification for membership is as follows:

From Section 8 of the Constitution.—"Charter members shall be such of the present membership of the American, Ohio or Western Gas Associations as shall be certified by the officers of the same to the Directors of the Institute as qualified respectively for Active, Junior or Associate membership, provided, that to become a charter member it shall be necessary for each person so certified to make application to the Directors of the Institute within a period of 60 days after notice has been sent him of the formation of the Institute."

In the judgment of the joint committee, appointed by the American, Ohio and Western Gas Associations to organize the American Gas Institute, no person delinquent for dues in either of the above Associations shall be eligible for membership in American Gas Institute until such delinquencies are paid.

From Section 5 of Constitution.—"To be eligible to Active Membership, a person must be at least 26 years of age, and be an officer or other employee of a gas company, or a consulting gas engineer, or an employee of a consulting gas engineer. He must be competent to act efficiently as the manager of a department of a gas company's business, and must have his chief interest in the gas business directly connected with the manufacture, sale or utilization of gas, and not the manufacture or sale of apparatus or appliances used by gas companies."

From Section 6 of Constitution.—"To be eligible as a Junior Member, a person must be over 20 years of age and be in the employ of a gas company, or of consulting gas engineer, and must be qualified either by experience or education to hold a responsible position under such employers."

From Section 7 of Constitution.—"To be eligible as an Associate Member, a person must be engaged in a pursuit which constitutes a branch of gas engineering, or to be otherwise qualified to assist in promoting the objects of the Institute."

All charter members are exempt from membership fees. The annual dues, however, are payable in advance as soon as the permanent organization of the Institute is effected.

LIBRARY OF CONGRESS OCT 1 1906 SMITHSONIAN DEPOSIT

For those who are not members in good standing, in either the Ohio, American or Western Associations, and who are qualified to become members, the following membership fee, including the first year's dues will be charged:

Active membership	$25
Associate membership	25
Junior membership	10

Annual Dues.

Active membership	$10
Associate membership	10
Junior membership	5

The committee in charge of the paper list for the first meeting of the Institute announces the following contributions:

On Behalf of the Pacific Coast Gas Association.—By Mr. Edward C Jones, San Francisco: "The Effect of High Compression on Artificial Gas."

On Behalf of the New England Association of Gas Engineers.—Title and author not yet announced.

On Behalf of the Illuminating Engineering Society.—By Mr. Van Rennsellaer Lansingh, New York: "Mantle Standards."

On Behalf of the National Commercial Gas Association.—Author and title not yet announced.

On Behalf of the Natural Gas Association of America.—Mr. J. W. Welch.

Reports, etc.—Account of former American Gas Light Association.—By Mr. Arthur G. Glasgow, Chairman, London, "Electrolysis."

Account of former Western Gas Association and Ohio Gas Light Association.—"Wrinkle Department," by Messrs. W. E. Steinwedell and Bryce McAdam, Editors.

Account of former Ohio Gas Light Association.—"Question Box," by Mr. Henry L. Doherty, Editor, New York city. "Progress Department," by Mr. A. E. Forstall, Editor, New York city.

"Novelty Advertising and New Business Methods Department," by Mr. George Williams, Editor, Madison, Wis.

"Information Bureau," by Mr. H. L. Olds, Editor, Lincoln, Ills.

"Committee on Uniformity of Gas Meters," by Messrs. Charles H. Dickey, Baltimore, Md.; Paul Doty, St. Paul, Minn.; H. C. Abell, Muskegon, Mich.

"Committee on Standard Methods of Testing Gas Fuel Appliances," by Messrs. Henry L. Doherty, New York city; F. W. Stone, Ashtabula, O.; John Franklin, Cincinnati, O.

"Committee on Uniform System of Mapping Street Mains," by Mr. W. H. Barnold, Saginaw, Mich.

"Committee on High Pressure Distribution," by Mr. J. D. Shattuck, Chester, Pa.; H. A. Carpenter, Pittsburgh, Pa.; J. O. Johnston, Columbus, O.; W. H. Hammon, Pittsburgh, Pa.

"Committee on Revision," by Dr. H. B. Harrop, Chairman, Milwaukee, Wis.

"Bureau of Forms and Records," by Mr. D. W. Low, Editor, Alliance, O.

Account of Western Gas Association.—"The Economic Balance between Calorific Value and Candle Power," by Mr. Thomas D. Miller, New Orleans, La.

"The Making of Rates and the Additional Business System of Costs," by Mr. W. H. Gardner, Jr., Boston, Mass.

It is the sense of those who have undertaken the responsibilities for the first meeting that no outside contributions be asked for the entertainment of the members at the coming convention. To this end, reply postal cards have been mailed to members asking that those who expect to attend the banquet immediately notify Mr. John Williamson, Chairman of the Committee of Arrangements, of their intention to subscribe $10 for such ticket and other entertainments as may be provided.

I would request again upon the members of the Ohio, American and Western Associations, that they attend to the notice received from the undersigned in reference to sending in their application.

The undersigned will be pleased to answer all communications in reference to the meeting, and to send membership applications to any not eligible for charter membership, who may wish to become members of the American Gas Institute.

JAMES W. DUNBAR,
Acting Secretary.

BRIEFLY TOLD.

THE FOURTEENTH ANNUAL MEETING OF THE MICHIGAN GAS ASSOCIATION.—"The fourteenth annual meeting of the Michigan Gas Association was successfully brought off at the Pantlind Hotel, Grand Rapids, Mich., on the appointed days—September 19, 20 and 21. The proceedings were ably directed by the President, Mr. W. H. Barthold, and his work was well fortified by the cleverness of Secretary Ewing and the gentlemen in charge of the various committees. In fact, perfect 'team work' characterized the proceedings throughout. Mayor Ellis gave the members and their guests (well over 200 were in attendance) the 'freedom of the city' in a neat welcoming speech, the tones of which had no better or heartier ring than were sounded in the reply thereto by Mr. J. J. Knight, of Kalamazoo. Mr. Glenn R. Chamberlin, the active, though sedate Secretary of the Grand Rapids Gas Light Company, had much to do with making life worth living during the convention time proper, and in the hours of ease that intervened between the studiousness of the sessions. President Barthold's address was well received, and in it he paid special attention to the excellence of the results achieved by the Association's sustaining in the University of Michigan a Gas Scholarship. It has the hearty support of every member of the Association. The paper list was lengthy and each number thereon was carefully prepared and interestingly discussed. From a technical standpoint the meeting was a brilliant one. The officers elected were: President, V. F. Dewey, of Detroit; Vice President, D. H. Fraser, Battle Creek; Secretary and Treasurer, Alonzo P. Ewing, Detroit. Kalamazoo was named as the next place for meetings. As was the technical side, so was the social side—eminently successful. The beefsteak dinner at the Lakeside Club was preceded by an inspection of the plant of the Grand Rapids Gas Light Company, the proprietors of which, and the operators thereof as well, are to be congratulated over its completeness and capacity. The 'dinner' was directed by 'Fred.' R. Persons as toastmaster, and he held down the job quite heavily. The two Eatons contributed much to the liveliness of the speechifying, the Rochester man having perhaps a trifle the better of it. Inverted burners were responsible for most of the illumination in the banquet hall. A very enjoyable trip to Fruitport was the feature of the outing for the last day. There can be no doubt about the complete success of the meeting, the credit for which is due to no one perhaps in particular, for many aided therein and thereto, but it would be unfair were it not suggested that the Grand Rapids Gas Light Company's folks are up to any task of any sort that may confront them.—G. S. S."

MR. RALPH WOODWARD RETIRES FROM ACTIVE SERVICE.—With much regret we report the resignation of Mr. Ralph Woodward from the position of General Manager of the Pittsfield (Mass.) Coal Gas Company, since May, 1901. His health has been not of the best for a year or more, and although his trip to the West Indies last year benefited him some, the recurrence of the rheumatic trouble from which he suffers prompted him to retire temporarily from active work, to seek recovery if a good period of rest will effect the wished for result. Of course he leaves Pittsfield with the best wishes of his former employers, associates and workmen. In fact, he was respected and liked by all for his considerate course in all such relations. He took service with the Pittsfield Company in 1901, going there from New Rochelle, N. Y., where he was in charge of the plant operated by the American Gas Company, but which now forms part of the property of the Westchester Lighting Company, of Mount Vernon. His success at Pittsfield was pronounced, and none regret more keenly Mr. Woodward's retirement from their service than do its owners.

DEATH OF MR. W. P. FODELL.—Death has claimed Mr. William P. Fodell, who died at his home in Philadelphia, the 25th ult., after a long and busy life, over 45 years of which was occupied in the gas industry. He was born in the Southwark district of Philadelphia, June 24th, 1832, and when quite a young man secured employment in the works of the Northern Liberties Gas Company, of Philadelphia, of which corporation he eventually became Treasurer. When the United Gas Improvement Company leased the Northern Liberties Company, Mr. Fodell was retained in the position that he had so long and faithfully filled. He was the author of a work entitled "Fodell's Bookkeeping for Gas Companies," which was standard in its day and time. He was an original member of the "Monks," a literary club that had its birth in Philadelphia more than half a century ago, the roster of which holds the names of many whose work and wit helped to make Philadelphia famous. For many years he was prominent in the Vestry Board of St. John's P. E. Church, of his native city, and for a score or more years was prominent in the Philadelphia School Board. His was a most lovable personality, and the good that he did in quiet and unobtrusive way for so many years remains a noble monument to his worth.

NOTES.—

THE 24th inst. has been set as the day for the sale at the receiver's hands of the Marquette County (Mich.) Gas Light and Traction Company's properties.

MR. THEODORE CLAUS, Secretary of the Cincinnati Union Gas and Electric Company, has been elected Secretary of the Cincinnati Gas and Electric Company.

The Removal of Naphthaline from Coal Gas—Third Paper.

[Prepared by ALFRED H. WHITE and JOEL M. BARNES,[1] for the Fourteenth Annual Meeting, Michigan Gas Association.]

Introduction.—The present paper is the sixth to be presented to your Association as the result of your support of a Fellowship in Gas Engineering at the University of Michigan. The study of the removal of naphthaline from coal gas has formed the subject of research reported upon at your last two meetings as it is also the subject now to be presented. Although the title is thus a restricted one, it is really the whole system of condensation in the gas works which is under investigation and discussion.

The report presented last year brought out two conclusions of importance. The first was that incomplete removal of tar before the gas was brought into contact with water in the scrubbers was responsible for most of the naphthaline troubles in the later portion of the works and in the city mains. It was shown that the ammonia dissolved the phenols, liberating in free form the naphthaline previously dissolved in the phenol. The other conclusion of importance was that the tar was not only the most powerful but practically the single agent effective in the normal removal of naphthaline in the condensing system, and that so powerful was this agent that at no point in the condensing system did the gas contain more than a small fraction of the amount which gas could hold if fully saturated at the temperature of the main when no tar was present. From the evidence of our tests it seemed apparent that if in the works examined all the tar had been removed by the P. & A. at the proper temperature, there would have been little possibility of naphthaline stoppages at a later period.

Attention was directed by us to a possible source of error due to the method employed for separating the gas from the mist-like particles of tar held in suspension. This was accomplished by introducing into the gas main a glass tube containing asbestos fiber and aspirating a cubic foot of gas through this and then through an absorption train containing picric acid. The naphthaline in the picric acid tube was assumed to be that present in the gas in the vapor state, while that retained by the asbestos indicated the amount dissolved in the suspended tar. In all the tests a portion of the sampling tube projected into the main, while the rest of its length was in the outside air. In all except the tests on the standpipes the portion within the gas main was long enough to collect all the separated tar so that there was no scrubbing of gas with colder tar. There are, however, two possible sources of error.

First, if there is not equilibrium in the gas main between the naphthaline as vapor and that dissolved in the tar, scrubbing with the separated tar will help to bring about that equilibrium. The results obtained will be those which would have been obtained in practice had the gas been agitated or passed through baffle plates in the main to hasten equilibrium.

The other source of error is due to the cooling of the gas in that portion of the glass tube outside of the main. It is possible that the temperature might be lowered enough to freeze out naphthaline or light oils which would dissolve naphthaline. It is apparent that this error will be the greater, the greater the temperature difference between the main and the surrounding air, and the longer the time which the gas is exposed to this cooling action. Both of these errors work in the same direction and tend to cause the naphthaline in the gas to be reported lower than it should be.

The most serious reproach which can be brought against the results previously reported is that perhaps they represent results which might have been obtained by proper frictional scrubbing and cooling rather than conditions actually prevailing. The smaller amount of tar and the nearer the system comes to room temperature the less will be any error of this sort, and it may safely be assumed that the errors are negligible beyond the secondary condenser. We have heard no objections raised against our conclusions of last year concerning the action of the scrubbers. Such data as have presented themselves during the present year's work confirm our previous results, but we have not carried our investigations much further in this direction. It has been taken for granted that in practice it is desirable to remove the largest possible amount of suspended tar prior to the arrival of the gas at the scrubbers, and we have studied especially the conditions surrounding the removal of this suspended tar in the condensing system with reference to the influence of temperature and length of contact upon the relative amounts of naphthaline held as vapor in the gas or dissolved in the tar.

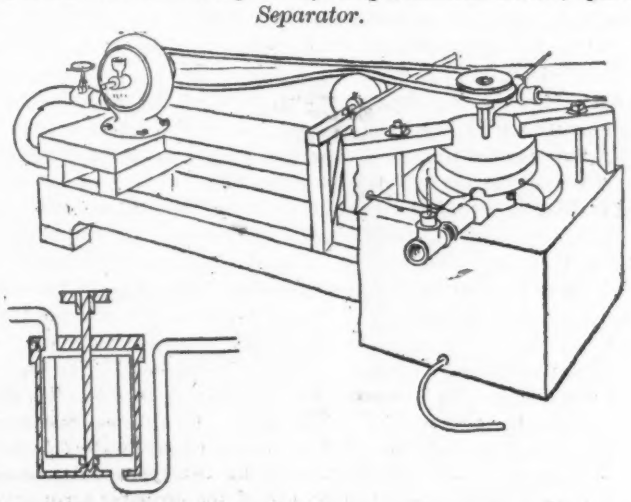
1. Holder of the Michigan Gas Association Fellowship in Gas Engineering at the University of Michigan for 1905–6.

Description of Experimental Centrifugal Tar Separator.—The P. & A. tar separator is a pivotal point in most condensing systems, and we desired especially to investigate it further with a view to confirming or disproving the conclusions announced last year. In view of the fact that there was a possibility of an error in method which might be serious, it was evidently extremely desirable to repeat the experiments in an entirely different way, which should not contain the objectionable feature of scrubbing the gas with separated tar.

The ideal arrangement requires a device to instantaneously separate the suspended tar and water globules from the gas without altering their temperature or subjecting them to other changes which might cause any disturbance of the quiet relations which existed between the gas and the suspended particles prior to their instantaneous divorce. It was decided that a small, high-speed centrifugal separator, while not fulfilling all the requirements, afforded the most practicable means of approximating the desired result. It was hoped by means of such a machine to separate the suspended globules rapidly and with a minimum of scrubbing action, and to deliver the gas from the machine in a condition to be tested for the naphthaline vapor which it might contain.

We found on record of experiments from which we could derive aid in designing such a miniature machine, and for the benefit of others present a sketch of the machine as it at present stands.

PLATE I.—*Sketch and Diagram of Experimental Centrifugal Tar Separator.*



The starting point was a bronze tar still, 5¾ inches internal diameter and 9 inches internal height. A ¾-inch pipe was inserted in the bottom for an inlet and one of similar size in the top for an outlet. A sheet iron drum, 4 inches in diameter with radial vanes ¾ of an inch in length and with proper clearance top and bottom, was put in the center of the cylinder. When the machine was in operation the gas entered at the bottom, passed upwards through an annular space where the blades whirled it rapidly around and finally passed out the top. When running at a speed of 1,500 revolutions per minute and drawing gas through at a rate of 1 cubic foot in 20 minutes, this machine removed 95 to 98 per cent. of the suspended materials. Inspection of the machine after a test showed that the upper third of the cylinder wall was almost entirely bright and free from tar, so that the tar must have been thrown out in the lower two-thirds of the machine. The sketch of the machine in Plate I. shows the way it was mounted and connected by a belt to a Pelton water wheel, and also gives an approximate idea of its construction, but does not show the jacket over the top of the machine, which has been removed from the sketch in order to better show the arrangement of the machine. This jacket was made of galvanized iron in sections so that it could be put in place after all connections had been made. It covered the entire top of the machine including the tar sampling tubes which are shown in position in the sketch. The inlet tube is shown with its thermometer in the foregound. The bottom part of the machine was much more efficiently jacketed than the upper part, as it was placed in a water jacket and further protected by asbestos tacked to the frame of the machine as shown.

Tests with the Centrifugal at the Inlet of the P. & A. Tar Separator.—In addition to the preliminary tests with the centrifugal machine which were defective for one reason or another, and which are all rejected, 3 sets of tests at the inlet of the P. & A. tar separator are available for discussion. These were made at the Ann Arbor, Detroit and Saginaw works.

To illustrate the manner of making the test we will describe somewhat in detail the method employed. The centrifugal was placed as

close to the inlet of the P. & A. as the arrangement of the works allowed, and was connected to the main by a ¼-inch pipe. As it was the intention to determine the effect of removing the tar without changing the temperature of the gas, the greatest pains were taken to keep the temperature of the machine constant, and at the same temperature as that prevailing in the main from which the gas was being drawn. The connection pipe was jacketed with a 3-inch tin pipe, connecting by a sleeve with the jacket surrounding the centrifugal so that when steam was blown into this jacket to keep the temperature up it also passed through the jacket along the connecting pipe.

Three thermometers were placed within the jacket of the machine. One projected through a tee directly into the gas as it entered the machine; another in a similar tee showed the temperature of the gas as it left the machine, while the third showed the temperature of the water jacket surrounding the bottom of the machine. One observer's time was practically entirely devoted to keeping these temperatures constant.

Gas samples were collected at both the inlet and outlet of the machine. A glass tube filled with asbestos fiber passed through a cork in a tee on the gas supply pipe at the inlet of the machine and connected through a bulbed tube filled with picric and acetic acids to a cubic foot aspirator. All the gas passing out of the machine passed through a similar asbestos tube and absorption train to an aspirator. The asbestos tubes were almost wholly within the constant temperature jacket of the machine, only their tips extending through holes in the wall and connecting to the absorption apparatus. By this plan the tar was filtered from the gas at the inlet in just the same way as in our previous tests, but the centrifugal having removed 95 per cent. of the tar and only a trifling amount remaining to be filtered out by the asbestos tube on the outlet, the result at the outlet should be free from the reproach that we are scrubbing the gas with the separated tar.

In making a test, after all connections had been made, the temperature of the machine and connections was brought to the temperature noted at the inlet to the P. & A., and then the experiment was started. It took about 20 minutes to pass a cubic foot of gas through the machine. It was impossible to pass the gas much faster and throw out the tar to a sufficient degree, and a higher speed also caused difficulty in absorbing the naphthaline by the picric acid. On the other hand a slower speed was undesirable because of the difficulty of keeping the machine at a constant temperature for a long time. In all these tests a sample was also simultaneously drawn from the outlet of the P. & A. so as to have a comparison of the efficiency of the two types of tar removers, and at the same time obtain an estimate of the probable error involved in the method of sampling employed previous to the adoption of the centrifugal.

Taking up the results of the first test at Ann Arbor (Test 17, Table I.), we see that the amount of suspended tar and water removed by the asbestos tube at the inlet of the machine (which equals the amount at the inlet of the P. & A.) is 1.503 grams per cubic foot, while the amount at the outlet of the machine is .202 gram, indicating a removal of 86 per cent. of the suspended tar and water. The suspended tar and water at the outlet of the P. & A. was .771 grams. This shows an apparent removal of less than 50 per cent., but allowance should be made for the fact that in this test at the outlet of the P. & A. the part of the asbestos tube projecting out of the main was somewhat cooler than that in the main, which allowed some water to condense and be separated that was present as vapor while within the main. A better comparison of the two separators may be made on the basis of tar removed. The samples were drawn in the same way and should be comparable, but the errors attendant upon sampling from a large main, a subject which will be discussed later, makes their absolute accuracy open to question. Another error in the absolute figures which does not affect the comparison much is caused by the volatility of the light oils of the tar. The separated water and tar are weighed together, but when it is sought to differentiate these constituents by drawing warm, dry air through the tube, not only the water but the light oil and naphthaline pass off as vapor. It is possible to absorb the water and to freeze out the naphthaline, but the volatile light oils escape and go to swell the amount reported as water. From laboratory distillations of larger samples of these tars the amount of this light oil thus lost is estimated at from 2 to 5 per cent. of the weight of the tar. The pitch-like constituents of the tar which do not volatilize are reported as "non volatile tar." The term is used instead of the "anhydrous tar" of our previous report, and differs from it in that the anhydrous tar included the naphthaline which is not included in non-volatile tar.

TABLE I.—*Tests at Ann Arbor Gas Works.*

Description of Tests.	Temp. Deg. F.	Weights in Grams per Cubic Foot of Gas.				
		Tar and Water.	Non-Volatile Tar	Naphthaline.		
				In Tar.	In Gas.	Total.
Test 17, 3-29-06.						
Inlet, P. & A	105	1.503	.329	.030	.031	.061
Outlet, centrifugal	107	.202	.006	.003	.011	.014
" P. & A	.....	.771	.050	.007	.011	.018
Test 18, 3-29-06.						
Inlet, P. & A	112	1.725	.363	.031	.032	.063
Outlet, centrifugal	114	.456	.012	.002	.015	.017
" P. & A	.....	.788	.049	.004	.021	.025
Test 19, 3-29-06. Primary condenser by-passed.						
Inlet, P. & A	113-115	1.274	.446	.038	.031	.069
Outlet, centrifugal	113-115	.287	.021	.006	.017	.023
" P. & A	.....	.751	.068	.005	.022	.027
Test 20, 3-30-06. Primary condenser by-passed.						
Inlet, P. & A	122	1.774	.505	.042	.045	.087
Outlet, centrifugal	123	.376	.018	.003	.028	.031
" P. & A	.....	.769	.091	.002	.030	.032

As was stated above, however, the tests of tar removed by the centrifugal and P. & A. should be fairly comparable. Comparing these figures we find the amount of non-volatile tar at the inlet to be .329 grams, while at the outlet of the machine it is .006 gram, and at the outlet to the P. & A. .050 gram. On a percentage basis this corresponds to a removal of 98 per cent. of the tar by the centrifugal and 84 per cent. by the P. & A. The weight of naphthaline in this tar was .030 gram for the inlet and .003 for the outlet of the centrifugal, and .007 for the outlet of the P. & A. The amount of naphthaline in the gas passing the asbestos filters was .081 gram for the inlet and .011 for the outlet of the machine, with the same amount at the outlet of the P. & A. This absolute agreement is merely a coincidence, but it is in accordance with the general trend of the results of the series. The centrifugal removed a much larger proportion of the tar than the P. & A., but the amount of naphthaline remaining in the gas was relatively the same in both cases. It is hard to see how there can be any very great error in the amount of naphthaline in the gas at the outlet of the centrifugal. Even adding the whole of the naphthaline in the tar at the outlet of the centrifugal and charging it to the gas only increases the amount in the gas from .011 to .014 gram. The fact that the two independent methods for naphthaline in the gas give concordant results indicates the correctness of both methods, and that the tests reported last year at the outlet of the P. & A. gave reliable results of existing conditions.

The amount of naphthaline in the gas at the outlet of the P. & A. is greater than was reported a year ago, but as the amount of gas coming to the P. & A. on the day of the present test at Ann Arbor was over 50 per cent. more than when the preceding test was made it may offer an explanation of the difference.

Effect of Raising the Temperature at the Inlet to the P. & A. at Ann Arbor.—The conditions at the inlet of the P. & A. and the changes taking place in the P. & A. are of interest, and will be discussed later, but at present we desire to restrict ourselves to a discussion of the effect of change in the temperature at the inlet of the P. & A. as effecting the removal of naphthaline by the centrifugal separator and the P. & A. at Ann Arbor gas works.

Test 18 was made in the same way as the one just discussed, but the temperature of the primary condeuser outlet was raised from 105° to 112° F. by closing the drafts. This was as high a temperature as could be obtained in this way, and to get one still higher the primary was by-passed altogether. Test 19 was taken at once before the temperature at the inlet to the P. & A. had risen much, to note the change caused by the more rapid arrival of the gas at the separator. Test 20 at 122° was made at the highest temperature which could be obtained with the primary by-passed. The full data of the tests are given in Table I. They show an increase of tar coming to the separators with increased temperature, but a practically constant percentage of the non-volatile tar removed independent of changes in temperature. The amount of naphthaline remaining in the gas as it leaves the separator is given in the following table:

TABLE Ia.

Test No.	Temp. Inlet Machine.	Grams Naphthaline per cu. ft. of Gas. At Inlet of Centrifugal.	At Outlet of Centrifugal.	At Outlet of P. & A.	Saturation Temp. Outlet of Centrifugal.
17.....	106	.031	.011	.011	64° F.
18	116	.032	.013	.021	70° F.
19.....	115*	.03I	.017	.022	72° F.
20.....	123*	.045	.028	.030	81° F.

* Primary condenser by-passed.

The series shows a very uniform increase in the amount of naphthaline remaining in the gas at the outlet of the separators with increasing temperature, and indicates a much closer agreement between the results obtained by the centrifugal and by the P. & A. than might have been expected. The percentage variations are in two cases considerable, but the actual amounts involved are so small that very slight errors cause large percentage differences. Although the centrifugal was removing 97 per cent. of the tar as compared with 83 per cent. removed by the P. & A., the two machines did not seem to differ much in the way they allowed the naphthaline to go forward in the gas.

In considering the changes which are apparently taking place in the centrifugal, it must be borne in mind that there is a possibility of error at the inlet due to scrubbing the gas with the separated tar. The figures at the outlet are believed to be nearly correct. If there is appreciable error at the inlet will the reported values for naphthaline in the gas be too high or too low? It is apparent that the only effect of this scrubbing will be to tend to bring about equilibrium in case it does not already exist. If the results at the inlet are too high it can only be because the tar is giving back to the gas naphthaline which it had previously abstracted at a higher temperature. This is a possibility, but does not seem a probability under the circumstances which prevail here. If, on the other hand, the results at the inlet are too low, it but increases the amount of naphthaline removal to be credited to the machine. With this understanding, the results are presented below.

TABLE IIa.

Test No.	Temperature.	Naphthaline in Gas. At Inlet of Centrifugal.	At Outlet of Centrifugal.	Per Cent. Removed while passing through the machine.
17.....	106° F.	.031	.011	64
18.....	116°	.032	.015	53
19.....	115°*	.031	.017	45
50.....	123°*	.045	.028	37

* Primary condenser by-passed.

The centrifugal was, without any drop in temperature, apparently removing from the gas an amount of naphthaline varying from 64 per cent. at 106° to 37 per cent. at 123°, in which latter case it should be noted that the primary condenser was by-passed. Results at Detroit and Saginaw show a similar drop in passing the machine, although the results do not show such close agreement with change in temperature.

TABLE II.—*Tests at Saginaw Gas Works.*

Description of Tests.	Temp Deg F.	Weights in Grams per Cubic Foot of Gas. Tar and Water.	Non-Volatile Tar.	Naphthaline. In Tar.	In Gas.	Total.
Test 29, 5-24-06.						
Inlet P. & A.....	142	1.720	.321	.029	.032	.061
Outlet, centrifugal.....	142	.680	.059	.003	.011	.014
" P. & A.....	139	.891	.112	.005	.020	.025
Test 30, 5-24-06.						
Inlet P. & A.....	136	1.286	.274	.026	.034	.060
Outlet, centrifugal.....	136	.273	.058	.002	.020	.022
" P. & A.....	134	1.045	.098	.004	.019	.023
Test 31, 5-24-06. Centrifugal running very slow						
Inlet P. & A.....	136	.8600	.198	.013	.028	.041
Outlet, centrifugal	136	.326	.123	.003	.016	.019
" P. & A.....	134	1.121	.126	.005	.023	.028
Test 32, 5-24-06. Centrifugal running very slow						
Inlet P. & A.....	140	1.639	.221	.017	.028	.045
Outlet, centrifugal.....	140	.457	.134	.004	.024	.028
" P. & A.....	138	.812	.093	.004	.018	.022

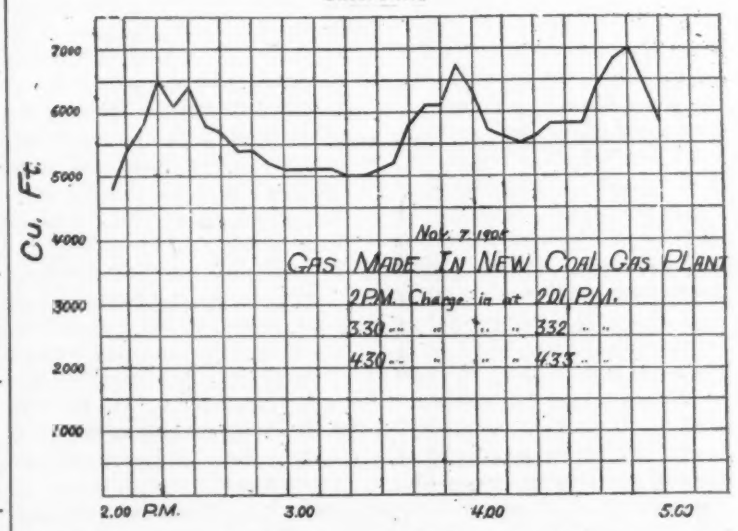
Comparison of Results at Ann Arbor, Saginaw and Detroit.—This naphthaline thus removed from the gas must be absorbed by the tar. Why did not the tar absorb it in the main? The only explanation can be that it was not given a chance. In our machine the speed of the gas is very materially slackened and the gas is stirred so that equilibrium will be more completely reached than in the sluggish currents of the main. If this explanation is correct, we should expect the same sort of result differing only in degree if the speed of the centrifugal was cut down till it became a mere mixing chamber, through which the gas passed at the same rate, leaving the tar to be removed by the asbestos filter. Experiments to test this were made at Saginaw where after two tests (29 and 30 of Table II.) had been made in the usual way, two more (31 and 32 of Table II.) were made with the centrifugal running very slowly. The results on the inlet do not differ very materially among the 4 tests. At the outlet the tests with the centrifugal running fast and throwing out 80 per cent. of the non-volatile tar, show .011 and .020 gram of naphthaline per cubic foot of gas, while the tests with the machine running very slowly and separating only 41 per cent. of the tar show .016 and .024 gram of naphthaline in the gas after the remainder of the suspended tar had been filtered out with asbestos. This result is only slightly in favor of the high speed separator. Apparently any machine which will agitate the gas and remove the tar will answer the same purpose. Inasmuch as this is exactly the function of the P. & A. it will be of interest to compare the results of the outlet of the centrifugal and the outlet of the P. & A. Twelve tests at the 3 works mentioned are available for this comparison. The data follows:

TABLE IIIa.

	Temperature	Grams Naphthaline per Cubic Foot Gas. At Outlet of Centrifugal.	At Outlet of P. & A.
Ann Arbor..	106	.011	.011
	116	.013	.021
	115	.017	.022
	123	.028	.030
Detroit.....	136	.029	.032
	117	.018	.011
	116	.016	.029
	138	.061	.058
Saginaw.....	142	.011	.020
	136	.020	.019
	138	.016	.028
	140	.024	.018
Average.....		.021	.024

This shows a slight advantage for the centrifugal which, however, is too small to be considered decisive, as the advantage is sometimes with one and sometimes with another. Our experimental centrifugal should have given the more regular results because the gas was drawn through it at a uniform rate while the P. & A. had sometimes to accommodate itself to variations of over 30 per cent. in the rate of flow within ½ hour at the time when the old charges were being drawn and fresh ones put in. This is shown very graphically by the mountainous character of the curve of Plate III.

PLATE III.—*Variation of Volume of Gas Made Plotted at 5-Minute Intervals.*



The tests at Ann Arbor as before noted show a uniform increase in the amount of naphthaline in the outlet gas as the temperature increases. Those at Detroit (Table III.) do the same with the exception of the first, where, on account of trouble with the machine, duration of the test was 30 minutes instead of 20. This test shows a larger naphthaline removal than the duplicate test 28 at a corresponding high temperature, and suggests that in the other tests the gas was being too rapidly separated from the tar to obtain the best results. The results at Saginaw belong in a class by themselves, because water gas was being mixed with the coal gas before the exhauster. This water gas was

TABLE III.—*Tests at Detroit Gas Works.*

Description of Tests.	Temp. Degs. F.	Weights in Grams per Cubic Foot of Gas.				
		Tar and Water.	Non-Volatile Tar.	Naphthaline.		
				In Tar.	In Gas.	Total.
Test 25, 4-25-06.						
Inlet, P. & A.	.....	2.261	.435	.038	.055	.093
Outlet, centrifugal	136	.785	.130	.005	.029	.034
" P. & A.	138	?	?	?	.032	?
Test 26, 4-26-06.						
Inlet, P. & A.	.....	1.634	.385	.041	.025	.066
Outlet, centrifugal	117	.480	.040	.004	.018	.022
" P. & A.	118	1.955	.149	.045	.011	.056
Test 27, 4-27-06.						
Inlet, P. & A.	.....	1.607	.379	.037	.026	.063
Outlet, centrifugal	116	.218	.046	.004	.016	.020
" P. & A.	118	2.242	.173	.026	.029	.055
Test 28, 4-27-06.						
Inlet, P. & A.	.....	2.844	.501	.041	.062	.103
Outlet, centrifugal	138	1.439	.056	.005	.061	.066
" P. & A.	140	2.729	.182	.020	.058	.078

about one-half the volume of the coal gas, but was being added at a constant rate while the volume of the coal gas fluctuated. The naphthaline in the outlet gas is lower than for a corresponding temperature at the other works, due probably to the mixed water gas.

In comparing the results of this year's tests at the P. & A. with those of last year, it is to be noted that almost all of the tests this year are made at decidedly higher temperatures than last year. This is partly due to the time of year at which the tests were made, and partly to increased production of gas with an unchanged condensing system. Our tests this year show uniformly larger amounts of naphthaline in the gas and our experiments, made by purposely varying the temperatures at the inlet to the P. & A., lead us to ascribe this increase to these higher temperatures, to which should be added the corelated influence of the effect of increased production in lessening the time which the gas remains in the condensing system.

The question now arises: What would have been the effect had the gas been allowed to cool to a lower temperature before removing the tar? To answer this question we have only the results of a number of tests at the Ann Arbor works, where the gas was allowed to cool somewhat in its passage through the centrifugal. In this set of tests the pipe connecting the centrifugal to the main was kept warm and the lower half of the machine was immersed in a water bath of the same temperature, but the top of the machine was exposed to the air of the room. Under these circumstances the naphthaline in the gas at the outlet varied from .003 to .007 gram per cubic foot, the average of the 4 tests being .005 gram, which could saturate the gas at 52° F. A direct comparison was made on the last test between the effect of the centrifugal under these conditions and the results shown by the P. & A., and it was found that while .007 grain was passing the centrifugal under these circumstances (sufficient to saturate the gas at 57° F.) .014 gram was in the gas emerging from the P. & A., working at 115° F., which is sufficient to saturate the gas at 69° F.

It is apparent from all these tests that a P. & A. tar separator helps in bringing about equilibrium between the gas and the tar and removes considerable of the suspended tar, but if operated at too high a temperature allows an unduly large amount of naphthaline to go forward. If the gas is cooled and sufficient contact allowed it is probable that practically all the naphthaline will be dissolved in the tar and removed with it. If the P. & A. is working at a high temperature and removing considerable of the tar, it may be open to question whether sufficient tar will be left associated with the gas to dissolve out the remaining naphthaline. The lack of a suitable method of determining the light oils and other volatile constituents as well as the naphthaline going forward as vapor has prevented us from presenting any figures on this important point.

Effect of Change in Differential Pressure of the P. & A.—These tests were prompted by a discussion in which Mr. Tippy stated that they found it advisable at their new plant in Detroit to run the P. & A. under a very slight differential pressure—less than ½ inch. They purposely allowed considerable tar to pass into the secondary condenser, as experience had taught them that if they removed the tar too completely at this point they were soon troubled with naphthaline stoppages in the latter part of the condensing system. He offered to demonstrate the matter, and accordingly raised the differential pressure in the P. & A. from ½ to 2½ inches.

After 5 days' time had been allowed to give the system time to adjust itself to the new conditions, we made a test of the condensing system according to the method reported a year ago. These tests were made in midsummer, when the inlet of the P. & A. was above 130° F. and presented temperature conditions different from any previously encountered by us. The weight of tar and water coming to the separator was larger than previously found, to be explained undoubtedly by the higher temperature. The weights both of tar and water leaving the P. & A. were also higher, in spite of the increased differential, as were the amounts of naphthaline in the gas.

Tests at the inlet to the box washer showed that this heavy non-volatile tar had been almost completely eliminated in the secondary and multitubular condensers, although sufficient remained to stain the asbestos somewhat, but that the suspended light oil, whose amount we have no satisfactory method of estimating, contained so much dissolved naphthaline that its amount was twice as great as that in the gas and tar together at the outlet of the P. & A. This is a most remarkable result and might be passed over as an experimental error did not the two tests on different days give entirely concordant results. As it is, it can only be noted but not explained.

These tests also show an important increase in naphthaline as the gas passes the scrubbers, the gas leaving saturated at 63° F. Under these circumstances it is not strange that almost before the results of this test had been obtained in the laboratory, the following letter was received from Mr. Tippy, showing a complete fulfillment of the prophecy made by him before commencing the test. The writers desire to place this letter on record, not only for the information it contains but also for the cordial spirit of helpfulness which it shows, and which we are happy to say has without exception greeted us in all our dealings with the gas fraternity:

DETROIT, Aug. 14, 1905.

Prof. ALFRED WHITE, Chemical Laboratory, University of Michigan, Ann Arbor, Mich.:

Dear Sir: On July 26th, 1905, we increased the differential pressure of our tar extractors to take out most of the tar at this point. The pressures all along the line were taken each morning and a record made of them. I will submit to you the differential pressures of the different pieces of apparatus, being the difference in pressure between the inlet and outlet of the apparatus at intervals of a few days' time between the time of starting the experiment and August 7th, 4 P.M., at which time we were obliged to by-pass a part of the apparatus on account of high pressure. Differential pressures were:

1905.	Secondary Condenser.	Multitubular Condenser.	Washer.	Rotary Scrubber.
July 26, 4:25 P.M..	$\frac{2}{10}$ in.	$\frac{4}{10}$ in.	$3\frac{6}{10}$ in.	$2\frac{9}{10}$ in.
Aug. 1, 8:30 A.M..	$\frac{1}{10}$ in.	$\frac{9}{10}$ in.	$4\frac{7}{10}$ in.	$2\frac{3}{10}$ in.
" 7, 8:10 A.M..	$\frac{1}{10}$ in.	$1\frac{3}{10}$ in.	$5\frac{5}{10}$ in.	$6\frac{7}{10}$ in.
" 7, 4:00 P.M..	$\frac{3}{10}$ in.	$2\frac{3}{10}$ in.	$9\frac{4}{10}$ in.	$8\frac{5}{10}$ in.

After removing the stoppages we decreased the differential pressure in the P. & A to $\frac{2}{10}$ inch, so as to let the light tars go forward. If you wish these tests repeated or if there are any other tests you wish made, I shall be glad to make them for you. Yours truly,

B. O. TIPPY,
Supt. Mfg. Dept.,
Detroit City Gas Company.

The stoppage was evidently to a small extent in the multitubular condenser but to a much larger extent in the washer and rotary scrubber where the ammonia was liberating free naphthaline in the manner pointed out in our paper a year ago. A further explanation of the phenomenon is, however, almost impossible because, instead of the change in differential pressure at the P. & A. being the only variable to be considered, the temperature of the P. & A. and the amounts of tar coming to it and passing forward from it are also widely different from any conditions before observed by us. However, the experience of the engineers of the Detroit Gas Company in handling their condensation system entitled their opinion to the greatest respect, and, therefore, systematic work was undertaken at Ann Arbor to determine the effect of changes in differential on the P. & A. there. The results will not be reported here as they were inconclusive. The disturbing factor when finally found was beyond our control and is discussed in the next paragraph.

Errors in Sampling from Large Gas Mains.—We had assumed that we could get a fair sample of the gas by inserting a sampling tube into the main, relying upon the mixing which the gas had received a few

seconds previously while passing through the exhauster, together with the pulsations of the exhauster to bring to our sampling tube in the course of 20 minutes an average sample of the contents of the main. This assumption was found to be totally erroneous, as shown by experiments here quoted. Two experiments were simultaneously made, in one the sampling tube being extended to practically reach the center of the 14-inch main and in the other the tube being extended only about ¼ inch beyond the inside line of the main, just sufficient to clear the wall and make certain that no tar could run down the side of the main and work into the sampling tube. The time required to draw a cubic foot through was 22 minutes in the first set and 24 in the set repeated later to guard against experimental error. The figures with regard to the tar and naphthaline are given below:

TABLE IV*a*.

Test No.	Temperature P.& A. Inlet.	Non-Volatile Tar.		Naphthaline in Tar.		Naphthaline in Gas.		Naphthaline. Total.	
		Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.
21 Center	100	.182	.044	.018	.005	.011	.010	.029	.015
21 Edge...	.....	.458	.092	.064	.008	.009	.009	.073	.020
22 Center.	105	.201	.044	.020	.004	.019	.017	.039	.021
22 Edge..	.....	.575	.059	.075	.010	.014	.012	.089	.022

These show almost 3 times as much suspended tar at the edge as at the center of the main entering the P. & A. with a smaller disagreement between the figures at the outlet. It is not believed that these figures can be due to experimental error. Experiments on the flow of water in large mains have shown that the stream in the center of a straight pipe travels considerably faster than that at the edges. If these same relations hold true for gas traveling in large mains it would seem natural that the solid particles should gradually be pushed into the more peaceful currents at the edge, and that the gas sampled near the edge of the pipe would contain an unduly large amount of suspended tar. This would explain our results at Ann Arbor, but would also cast doubt on the accuracy of all figures obtained by us, as there is no means of knowing how closely the samples we obtained were average ones. It is to be noted, however, that although the disagreement is large on the suspended tar there is only a small difference in the weights of naphthaline in the gas, and that it is the naphthaline in the gas which is of greatest importance to us.

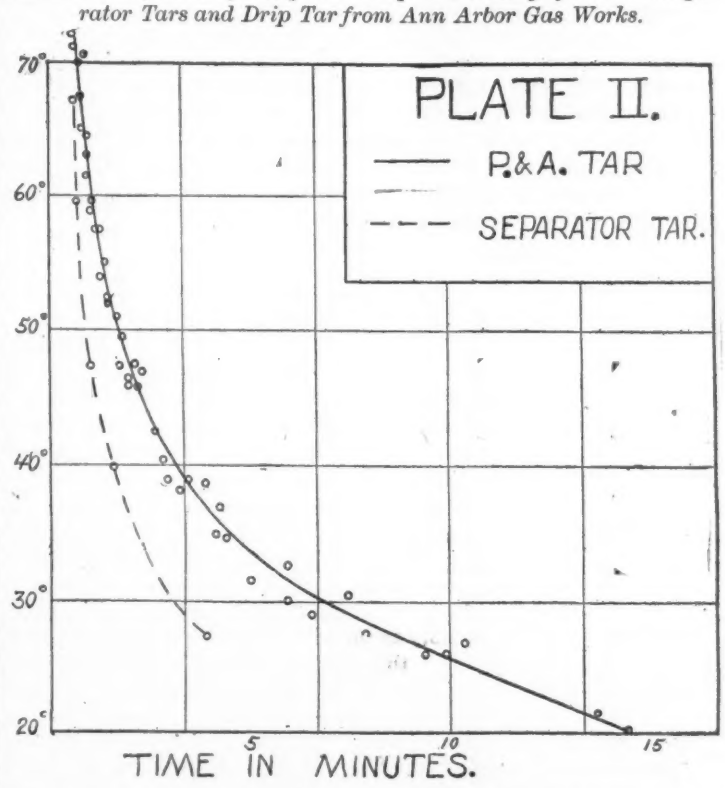
The results on naphthaline are believed to be fairly reliable. The results on amount of tar coming to and leaving the P. & A. are roughly comparable with one another on account of the agreement in method of sampling employed, but do not necessarily represent a fair average of the conditions prevailing in the gas main.

The necessity of estimating the suspended tar and preventing drop in temperature while removing it prevents application of the usual methods for insuring a fair sample of gas, and no way has suggested itself of avoiding the error. On this account we do not place very great reliance on the figures showing the amount of tar coming to the P. & A. The amount of tar leaving the P. & A. is much more accurately estimated, and there should be no error of sampling at the outlet of our centrifugal separator, as the whole of the gas passed through the asbestos filter in each experiment. The error has no large effect on the reported amount of naphthaline in the gas but prevents any accurate estimation of the amount of suspended tar. It is possible by careful manipulation to get fairly comparable results, and it is not believed that the errors involved in any of the results presented in this paper would nullify the conclusions drawn.

Change of Viscosity of Tar with Temperature.—Before this error in sampling was discovered considerable work was done on the viscosity of tars at different temperatures, with the idea that the differences in viscosity from day to day might be an important factor governing the removal of tar by the P. & A. separator. All the tests were on the P. & A. at Ann Arbor, and those reported here were made with a Redwood viscosimeter, this instrument giving more uniform results for our purpose than a Doolittle viscosimeter.

The curve of Plate II., showing the viscosity of the Ann Arbor P. & A. tars, is plotted from observations on 5 tars drawn from the P. & A. under different conditions. All the points are recorded. The agreement is as close as can be expected and does not indicate any difference in the viscosity of the tar from day to day which can be considered of importance. The influence of slow and rapid cooling of the tar from a higher temperature was also investigated and likewise showed no noticeable effect on viscosity. The experiments are then of only negative value, but the curves are presented here, as no results of a similar sort have been noted in the literature, and the change of viscosity with temperature may be of interest.

PLATE II.—*Influence of Temperature upon Viscosity of P. & A. Separator Tars and Drip Tar from Ann Arbor Gas Works.*



The second curve on the plate represents the viscosity curve of a tar drawn from a drip on the main connecting the P. & A. and secondary condenser. It represents the tar which passed the P. & A. with the gas and separated out a little later in the system. It has a lower specific gravity and is also much less viscous, especially at ordinary temperatures.

Equilibrium between Heavy Tar Constituents and Naphthaline Vapors.—The question of the conditions governing equilibrium between the naphthaline dissolved in the tar and as vapor in the gas has been studied further this year, but has proved a most difficult subject. The method employed by us last year gave the equilibrium existing between a sample of tar with gas kept continuously saturated with naphthaline vapor, the whole system being at constant temperature. This did not give conditions prevailing in the works as was recognized, and explicitly stated, but it gave a good indication of the very powerful solvent power which tar has for naphthaline. We have not been able to devise a method which would satisfactorily reproduce in the laboratory the conditions prevailing in the works, but have made some experiments which throw a little more light upon the absorbent power of the heavier constituents of the tar.

In these experiments air or gas was slowly drawn through a U-tube containing naphthaline and passed from that to a tee where the stream divided, one-half passing through a tube containing the tar or pitch under investigation and the other half by-passing this pitch tube. Each steam passed through a naphthaline absorbing train and thence to its own aspirator. The amount of naphthaline in the by-passed gas represents the amount at the inlet of the tar absorption tube and that at the outlet the amount escaping absorption by the tar tube, while the difference gives of course the amount taken up or given off by the tar.

The first test was made on P. & A. tar from Ann Arbor, which analysis showed to already contain 10.8 per cent. naphthaline. About 10 grams of this was mixed with asbestos to offer a larger surface and placed in the apparatus kept at 25° C. = 73° F. Gas saturated with naphthaline at 37° C. = 98° F., was drawn through at the rate of 1 cubic foot in 12 hours which was so slow that it was judged equilibrium would be quite completely attained. As will be noted the gas was supersaturated at the temperature of the tar tube, and would, therefore, deposit naphthaline. It actually left the tube saturated at 20° C. = 68° F. This indicates a slight absorption of naphthaline by the tar, represented by the difference required to saturate the gas at 73° and 68° F., but the amounts involved are so small at these temperatures that too much reliance should not be placed upon this small difference, and we must consider that the tar at this temperature has only a slight capability of absorbing naphthaline, if it has any at all. The temperature

of a duplicate tar tube was raised to 32° C. = 90° F. and gas supersaturated for that temperature slowly drawn through. It left the apparatus saturated at 31° C. = 88° F., again a scarcely appreciable difference and showing no action on the part of the tar.

The temperature of the tar tube was then raised to 52° C. = 126° F. The gas passing in was not quite saturated for this temperature, being saturated for 47° C. = 117° F., but it left the tube saturated at the much lower temperature of 39° C. = 102° F. This difference, 126° to 102°, is too large to be due to experimental error. The tar is very evidently taking up naphthaline from the gas at this temperature. A repetition of the experiment at a slightly higher temperature showed a similar result. The results are summarized below:

SERIES I.—*Ann Arbor P. & A. Tar.*

Entering Gas Saturated at	Temp. Tar Tube.	Exit Gas Saturated at
1....37° C. = 98° F.	23° C. = 73° F.	20° C. = 68° F.
2....48° C. = 128° F.	32° C. = 90° F.	31° C. = 88° F.
3....48° C. = 117° F.	52° C. = 126° F.	39° C. = 102° F.
4....52° C. = 125° F.	54° C. = 129° F.	45° C. = 113° F.

As a different tar upon which to try a similar experiment a hydraulic main tar from Detroit, carrying 5.1 per cent. naphthaline, was chosen. This showed an absorption of naphthaline at all three temperatures tested, as shown below:

SERIES II.—*Detroit Hydraulic Tar.*

Entering Gas Saturated at	Temp. Tar Tube.	Exit Gas Saturated at
1....44° C. = 111° F.	38° C. = 100° F.	31° C. = 88° F.
2....44° C. = 111° F.	51° C. = 124° F.	32° C. = 90° F.
3....43° C. = 109° F.	61° C. = 142° F.	42° C. = 107° F.

Carrying the subject a step further a pitch was next tried, and, as an extreme case, a hard and brittle pitch made from a hydraulic tar from Monroe was chosen. The following results were obtained:

SERIES III.—*Monroe Pitch.*

Entering Gas Saturated at	Temp. Pitch Tube.	Exit Gas Saturated at
1....46° C. = 115° F.	50° C. = 122° F.	25° C. = 77° F.
2....68° C. = 154° F.	70° C. = 156° F.	41° C. = 106° F.
3....85° C. = 185° F.	90° C. = 164° F.	66° C. = 151° F.

A comparison of these three tars and pitches is interesting. The Ann Arbor P. & A. tar is the only one tried below 38° C. = 100° F. At the temperatures below this the tar was either saturated so it could not absorb any more naphthaline, or was so cold that in spite the large surface it did not react at any measurable rate. Whichever the cause, it is useless for further naphthaline absorption below 32° C. = 90° F. At the next temperature tried it was able to take out naphthaline so that, though the temperature of the tar was 126° F., the gas gave up so much of its naphthaline that it went out saturated at only 102° F.

The Detroit hydraulic tar and the Monroe pitch were tested at so nearly this same temperature that the three results can be compared directly:

Temp. of Tar Tube.	Exit Gas Saturated at	Per Cent. Naphthaline in Tar at Close of Experiment.
Ann Arbor P. & A..126° F.	102° F.	11.6
Detroit hydraulic....124° F.	90° F.	5.9
Monroe pitch.....122° F.	77° F.	2.1

This shows that at the same temperature the pitch is able to take out the naphthaline more completely than the hydraulic tar, which in turn is better than the P. & A. tar. The comparison is not quite a fair one, however, for, as will be seen from the last column, the P. & A. tar labored under the disadvantage of containing twice as much naphthaline as the pitch. It is possible that the tars would have shown as good a result could they have been started with about 1 per cent. of naphthaline as the pitch was. However that may be, there can be no denying that these experiments with pitch show very strikingly its power to reduce the amounts of naphthaline far below that required for saturation. The second experiment of Series III. with Monroe pitch illustrates this. Starting with about 1 per cent. of naphthaline at 158° F., it took up naphthaline from the gas coming to it until it had absorbed 4.5 per cent. of naphthaline in addition to what it held previously, so that it contained about as much as the usual hydraulic main tars. While thus working at 158° F. it removed a mean amount of 84 per per cent. of the naphthaline coming to it and allowed the gas to go forward saturated at only 106° F. Since the gas came to the pitch tube with more naphthaline than it had when leaving, any error due to nonattainment of equilibrium would make this figure of 106° too high, and would mean that the tar was really doing more work than it was getting credit for. It is believed that this experiment gives a fair picture of the way pitch acts in removing naphthaline in the standpipe and hydraulic mains.

An attempt was made to get at the equilibrium from the other side by mixing pitch with naphthaline and noting the amount of naphthaline given back to gas free from naphthaline which was aspirated through it. To afford as large a surface as possible the pitch was melted and mixed with 10 times its weight of coarse sand. While still warm the naphthaline was stirred in and the mixture at once bottled to prevent volatilization of naphthaline. Dry air at a specified temperature was drawn through slowly and the amount of naphthaline taken up was estimated. A new pitch tube was used for each experiment, so that the amount initially present was always the same, and the amount withdrawn in any experiment was never over 4 per cent. of that initially present. The results follow:

SERIES IV.—*Monroe Pitch with 3 per cent. Added Naphthaline.*

Temp. Pitch Tube.	Exit Gases Saturated at
60° C. = 140° F.	32° C. = 89° F.
80° C. = 176° F.	39° C. = 102° F.

SERIES V.—*Detroit Condenser Pitch with 3 per cent. Added Naphthaline.*

Temp. Pitch Tube.	Exit Gases Saturated at
60° C. = 140° F.	33° C. = 91° F.
80° C. = 176° F.	40° C. = 104° F.

These two sets agree very closely with each other, and also take their place in Series III., which approached equilibrium from the other direction well enough to give them considerable credence as actually indicating the conditions of equilibrium under these conditions. If we take all the results for the Monroe pitch in both series we have:

Series.	Temp. Pitch Tube.	Exit Gas Saturated at	Per Cent. Naphthaline in Pitch at Close of Experiment.
III.	50° C. = 122° F.	25° C. = 77° F.	2.1
IV.	60° C. = 140° F.	32° C. = 89° F.	2.9
III.	70° C. = 158° F.	41° C. = 106° F.	5.7
IV.	80° C. = 176° F.	39° C. = 102° F.	2.8
III.	90° C. = 194° F.	66° C. = 151° F.	11.5

The fourth result in the list is out of accord with the others, but its lower percentage of naphthaline undoubtedly accounts for it in large degree.

These figures show that pitch is able to absorb considerable naphthaline at high temperatures, but they do not indicate how great must be the absorptive power exerted. Considering the results of Series IV. we find:

Temperature Pitch Tube.	Milligrams Naphthaline to Saturate 1 Cubic Foot of Gas at this Temperature.	Exit Gas Actually Saturated at	Naphthaline to Saturate 1 Cubic Foot at this Temperature.
60° C. = 140° F.	408	32° C. = 89° F.	46
80° C. = 176° F.	1,250	39° C. = 102° F.	84

This shows that at the lower temperature this pitch containing 3 per cent. of naphthaline allowed the gas to take from it only 45 out of the 408 milligrams naphthaline the gas demanded, and at the higher temperature only yielded 84 out of the 1,250 required to saturate the gas. At the lower temperature the gas had to go forward only 11.2 per cent. saturated; at the higher temperature only 6.8 per cent., and this although the pitch already contained 3 per cent. of naphthaline.

The conclusions reported in our paper last year claiming this great absorbent power for pitch at rather high temperatures were vigorously controverted by Professor Colman in the *Journal of Gas Lighting* on theoretical grounds. Dr. Colman believes that the governing factor is the increasing vapor pressure of the naphthaline at the higher temperatures, and he regards the tar as a purely passive receptacle. In view of this evidence the claim that pitch absorbs more naphthaline at the higher temperatures simply because the vapor pressure of the naphthaline is higher seems hardly tenable. The vapor pressure of the naphthaline does increase rapidly, but the absorptive power of pitch increases more rapidly up to a maximum temperature which has not yet been determined, but which probably exists.

The influence of temperature on absorption of naphthaline is also illustrated by Series I. with the Ann Arbor P. & A. tars. In experiments 2 and 3 of this series the amount of naphthaline coming to the tar tube is the same, it being saturated at 117° to 118° F. In experiment 2 the gas leaves the tar tube practically saturated, going out saturated at 88° F. while the tube is at 90° F. In experiment 3 the tar takes up naphthaline and the gas goes out only 36 per cent. saturated for the temperature of the tar tube. It actually went out at a temperature of 126° F., but only contained naphthaline enough to saturate it at 102° F. This would indicate that the tar was saturated for the lower temperature of 90° F. but was not saturated for the higher temperature of 126° F., all other conditions being the same.

There is one other bit of evidence on the subject. Sample 3 of Monroe pitch, Series III., had absorbed 10.5 per cent. of naphthaline at 194° F. After the experiment the tube was corked up and left on a shelf. After a day or two, crystals of naphthaline were noted in the tube,

which increased in number. They must have come from the gas originally. The gas as it went into the tube was not quite saturated and it left it much less saturated, so that the deposition of naphthaline cannot have been due to an initially supersaturated gas. The only explanation is that the tar was able to hold the naphthaline in solution at the higher but not at the lower temperature, and that the usual variations in room temperature have caused this free naphthaline to crystallize in its well known manner.

In considering the results of the absorption of naphthaline by pitch it seemed of interest to try and analyze the process further by differentiating between the pitch proper and the so-called free carbon. Accordingly a tube was made up of pitch and sand as usual and thoroughly extracted with chloroform in a soxhlet extractor. The soluble pitch after evaporation of the chloroform was mixed with more sand and exposed to gas carrying naphthaline in the same way the pitches had been. At 86° C. = 187° F. this extractive matter from Monroe pitch dissolved 5.1 per cent. of naphthaline, 92 per cent. of which was later recovered by aspirating air through it. At 60° C. = 140° F. only 1.8 per cent. was taken up, of which 96 per cent. was afterwards recovered. This does not differ much from the behavior of the pitch.

Absorption of Naphthaline by the "Free Carbon" of Tar.—The tube containing the residue of free carbon and sand left after extraction with chloroform was tested in a similar way to determine whether it could absorb naphthaline. The tube was maintained at 80° C. = 176° F., the entering gas was 71 per cent. saturated for this temperature, and the gas leaving was at the average only 24 per cent. saturated. The amount of naphthaline absorbed was 96 per cent. of the weight of the free carbon. It was then sought to recover this naphthaline by reversing the process and drawing dry air through the tube at the same temperature. The naphthaline tube in the ice bath came to a constant weight after 12 hours when 49 per cent. of the naphthaline had been recovered. By heating the carbon tube to dull redness 13 per cent. more was recovered, but the carbon burned off and doubtless some of the naphthaline did also. That experiment has been repeated a number of times. This free carbon from the Monroe pitch can take up almost 10 per cent. of naphthaline at 80° C. = 176° F. and 6.6 per cent. at 70° C. = 158° F., but it has never been possible to recover over two-thirds of it by drawing air through. Whether this free carbon is equally as effective in the gas mains must be a matter of surmise. There are of course many other vapors present in much larger amount than naphthaline, and there is no reason for believing that naphthaline would be the sole recipient of the carbon's attention, so that the practical importance of the free carbon may not be very great. A single experiment was made upon coke to see what its absorptive power would be, but under the same circumstances it only took up .3 of 1 per cent.

We have also tested the effect of asbestos suggested by Professor Colman as a possible source of error in our work, but have not found it to absorb more than the merest trace of naphthaline.

Summary and Conclusions.—The experiments presented in this paper show that the suspended tar and water in an unpurified gas are not uniformly distributed throughout the cross section of the main but are far greater at the edge than near the center. It is difficult to fulfill all the complicated requirements required by our work and use any of the usual methods for obtaining a fair sample of gas, and all our results are open to the suspicion that they do not correctly represent the composition of the gas in the main. Fortunately the error in the amount of naphthaline in the gas is not as large as the error in the amount of tar and water. The error in the suspended tar is also not large beyond the P. & A. tar separator, and it is believed all the results on naphthaline throughout the system and those on suspended tar beyond the P. & A. are fairly reliable.

To obviate the possible errors due to filtering the gas through the separated tar, a miniature high-speed centrifugal separator was built, and is here described, which took the gas from the main and mechanically separated over 95 per cent. of the suspended tar without change of temperature,

The results obtained by this machine on tests for naphthaline in the gas agree well when compared with tests made according to the methods reported a year ago, and, as a common error in the two methods is improbable, indicate that both methods give fairly correct results. The paper presents a careful study of conditions at the P. & A. separator at 3 works. They all show a larger amount of naphthaline in the gas coming to and leaving the P. & A. than was reported last year. This is laid largely to the higher temperatures prevailing at the P. & A., and in part to the more rapid condensation incipient to the increased production which does not allow attainment of equilibrium. The amount of naphthaline in the gas at the inlet to the P. & A. in these works is greater than at the outlet. The agitation in the tar separator aids in bringing about equilibrium between the naphthaline in the tar and in the gas. The centrifugal tar separator acts little more efficiently than the P. & A., provided no drop in temperature is allowed in it, and probably works in the same way. If, as seems apparent, the gas does not have time to come to equilibrium with the tar with our rapid methods of condensation, it would seem to indicate that baffle-plates or stirrers might with advantage be employed to agitate the gas in the earlier stages of the condensing system, as is reported to have been successfully tried in England by Mr. Everitt.[1]

Under the conditions observed this year rather more naphthaline than is desirable tends to pass the P. & A. At the higher temperatures considerable light oil also passes the P. & A., but whether that is sufficient in quality and quantity to take care of this naphthaline in the later stages of the condensing system, is a point we have been unable to determine because of the difficulty of estimating these small amounts of light oil.

A laboratory study of the equilibrium between the naphthaline as vapor in the gas and dissolved in the tar confirms the conclusion announced last year that the heavy constituents of the tar have very great solvent power for naphthaline at high temperatures. The free carbon accompanying the tar can also occlude naphthaline.

Most of the naphthaline of the gas is probably absorbed by these heavy tars at a rather elevated temperature, but it must not be understood that all of it will or can be so dissolved. As was shown last year there is a gradual drop in the amount of naphthaline vapor as the gas passes from the standpipes to the P. & A., where it should practically all be dissolved in the tar. This final elimination of the naphthaline is probably brought about by the lighter constituents of the tar which have not yet condensed at the higher temperatures and, therefore, could have exerted no solvent action.

The influence of these lighter oils has not been discussed in this paper because of difficulties in sampling and analysis. A study of their behavior is most important but will be difficult to make with present methods. The plan thus far followed of making tests in various works has been of great value as a means of indicating what conditions are common and which are exceptional. The discovery that tar in the scrubbers was instrumental in causing naphthaline stoppage would probably not have been made so quickly in any other way. The objections against this method of procedure are the increasing number of variables which are known to affect results, and the impossibility of controlling all these conditions in a works, however willing the management may be; the difficulty of getting an accurate sample from a large main; the difficulty of transporting and erecting an outfit to handle large samples of gas, and the uncertainty of results from a small one, especially with regard to the light oils.

The best results can only be obtained by a careful collection and observation of all data which can have a possible bearing on the subject, all conditions being kept constant except the one under observation. We believe that the result can be obtained with closest regard to practical working by connecting a separate condensing plant to a full-sized retort of a full-sized bench so as to get working conditions. All the gas from this one retort should pass into this condenser which should be adjustable in size to allow study of rapid and slow condensation. There should also be a tar separator and a meter to register the rate of flow. A small purifier and a relief holder connected to a photometer bench would allow determination of candle power. It is believed that a plant of this sort would allow a study of all the most important factors of condensation, as well as those pertaining to the reactions in the retort, and would give results of far more value than a continuation of the present system of making tests at different gas works.

[Prepared for the JOURNAL, by "R."]

Regarding the Flywheel of the Gas Engine.

The flywheel of the gas engine of the present date is of a very different type from the cumbersome article used some years ago, for more time and care are given to flywheels nowadays. It is necessary that this should be so because of the severe work to which the wheel of the high speed gas engine is subjected, hence the builders of gas engines devote considerable time to the proper adjustment of the flywheel. When the wheel is first adjusted, it is as a rule perfectly balanced. It may prove a little too heavy on one side, but this is overcome by riveting a few pieces of metal to the light side. It may be that the wheel wabbles because of the wearing of the sleeves of the journal carrying

1. *Gas World*

the shaft; therefore we examine the journals and rectify imperfections of this character by restoring the worn pieces with new ones. Or perhaps you may need a little Babbitt metal. You can melt this material, build up the shaft and bearing to the correct center, and pour. The metal will harden in the right place, sustaining the shaft as in a new bow, thereby making a remedy for the unequalness of the shaft.

Fig. 1 illustrates a flywheel in perfect balance so far as side wabbling is concerned, for it is true along the horizontal lines from top to bottom. If a wheel of this adjustment has to run a belt the belt will almost invariably run true. The wheel may, however, be thrown out of balance by wearing of the bearing in the hub. The hub defect may be remedied by inserting thin sheet metal, thus putting the bore out of the center unless great care is taken. The result is that the wheel rides up and down and the balance is lost. Then again, we find instances in which the wheel is perfectly true on the shaft, but thrown out of line by being tilted over on one side, as shown in Fig. 2. An examination will reveal the tapering union at *B*. You may attempt to draw the halves or the quarters together with the bolt and find that it cannot be done, which failure is due to the sides of the wheel "finding" an untrue position resulting from weaknesses at the connections. Perhaps the nuts on the bolts have worked free. You can utilize some thin pieces of tin to advantage in getting the sections of the wheel "to rights." The object is to get off the crooked line *B*, and on the straight line *A*, as in Fig. 1. It may take some skillful work to accomplish the end, but if you use the tri-square on the hub, and the long T-square for the sides, after considerable patience you can true the latter to a practicable uniformity.

One of the most troublesome adjustments is explained in Fig. 3. The sections of the wheel are moved over one another, making the flanges untrue. The cut shows the condition in somewhat enlarged form, so as to make the defect plain. The object is to get the sections to be even at *C*. Your wheel may be warped out of order; if so, the file and tin packing will be required, and you will have to coax the parts together. The holes for connecting bolts may require filing out to allow greater margin of space. I have seen cases in which wedges were driven for the purpose of getting the sections of a wheel in position. The condition in exaggerated form is shown in Fig. 4 with the wedge driven, as at *D*. In case the sections are tilted very much out of place this system can be used to restore them. Usually the wedge system is imperfect, for the tapering edges of the wedge cause it to work free and slip out, unless first bored and riveted. Then I have seen wheels put out of true by incorrect setting on the shaft. Fig. 5 illustrates the result of adjusting a wheel on a shaft of too large diameter. The connecting bolts are exhibited in the intersection between the flanges at *E*. Sometimes in cases of this kind the rim is found to be too large for the hub adjustment; the hub may be right and the rim wrong. You can make and insert steel slides, one or more between each section, as at *F*, Fig. 6, if desired. The inserted pieces are drilled with holes corresponding with the holes of the wheel flanges. When the conditions are the reverse, and the flanges of the sections touch before the hub sides meet, the face plates of the sections can be filed down without very much trouble. Some of the flywheels of gas engines are built on the plan shown in Fig. 7. The face of the wheel, instead of carrying a belt, conveys power to the corresponding wheel by frictional contact. Hence it is necessary to get a perfect setting and correct balance in order that the two contacting surfaces may bind evenly at *G*. I have seen such irregularities partly overcome by covering both faces of the wheel with leather, as the pliability of the leather tends to even up minor defects. You may have to remove the wheels and have them turned down in a lathe, to get an even surface. It is not always an unequal balance that creates trouble. I recollect a case in which a gas engine was put into a manufacturing department to drive some machinery. The adjustments were on the plan shown in Fig. 8. A heavy belt was placed on the wheel, as at *H*. The little engine had all it could do to move the load placed upon it. Supposing the belt was not tight enough, the workmen "took up" on it, with the result that the belt pulled down on the shaft until it was sprung to the line *H*. This caused binding in the bearings, heating and squeaking. The workmen declared that the wheel was out of balance and tinkered at it with this idea in view. No remedy coming, they finally did the right thing and established another support by putting up a journal to hold the outer end of the shaft.

Sometimes the belt carried on the face of the flywheel will develop troubles which are very much like those emanating from an unbalanced wheel. Fig. 9 shows how the writer found one belt in operation. The ends of the belt were open fully 4 inches at the lacing. Everytime this stretch of lace leather struck upon the wheel, slipping resulted, and the workmen attributed it to an unbalanced wheel. The trouble was speedily rectified by removing the lacing and drawing the ends up close for a complete union. Another instance that comes to mind is where the flywheel was supposed to be out of true because the sewing of the belt, as in Fig. 10, made the wheel incline to the right and to the left every time the angle of the splice struck upon the same. There were indications of an unbalanced wheel; but the trouble was fixed promptly by sewing the union correctly. Then you get a thumping noise from your gas engine by splicing in a piece of leather to extend the belt, as in Fig. 11. The men often get deceived as to the

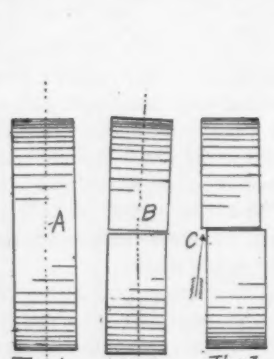


Fig 1 Fig 2 Fig 3

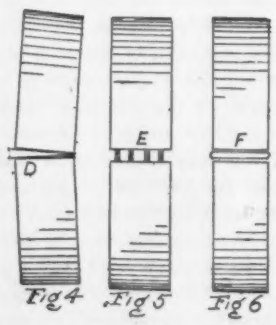


Fig 4 Fig 5 Fig 6

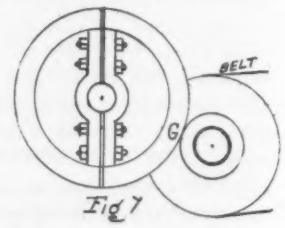


Fig 7

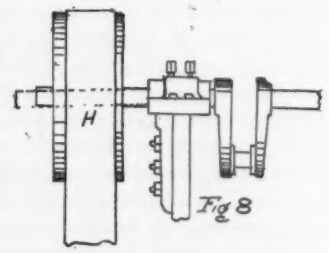


Fig 8

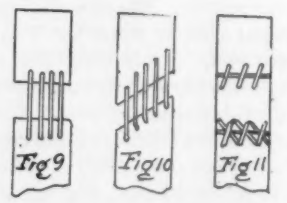


Fig 9 Fig 10 Fig 11

cause and effect of the inserted piece in the belt on the flywheel. The flywheel belt should be free from joints of this character, for every time the bunch of material strikes the wheel, a knocking condition arises, causing you to think the wheel is untrue, whence you go to work at the boxes. Fix the belt union and all will go well.

The Busey Babbitt Melter.

The Busey Burner Company, of Baltimore, Md., is putting on the market a new type of gas melting furnace known as the Busey Babbitt smelter, for melting Babbitt, lead, solder and similar metals which fuse at low temperatures, an illustration of which is here given. In this furnace the use of a fan blast or compressed air is entirely dispensed with, the type of burner used being so constructed that sufficient heat is developed without either. The air enters the burner tube at the base and is warmed by the radiated heat before mixing with the gas, producing an intensely hot blue flame which surrounds the bottom and sides of the melting pot.

The furnace itself consists of a sheet iron drum lined with firebrick, resting on a cast iron base, the whole being bolted together by vertical side rods. The melting pot rests on a cast iron ring, practically sealing the opening and precluding the loss of useful heat at the top of the furnace. Perforations in the casing permit the escape of waste gases and are so adjusted as to confine a maximum heat in the region of the

melting pot. The claims for the melter are that it is practicularly safe, convenient and economical, and that compared with other melters using gas a saving of 30 per cent. can be effected in the time of melting and the consumption of gas.

The size of furnace shown has a capacity of 50 pounds per charge, and is especially adapted for use in machine shops, foundries and factories. Larger sizes for special work are also made.

A Dust Preventer for Public Roads.

[A paper read by MR. WALTER LISTER, of Godalming, at last meeting of the Welsh District Institution of Gas Engineers and Managers.]

The dust nuisance on our public roads has been, and still is, a topic of much conversation; but up to now there has been little done to cope with it, and complaints are daily received from all parts of the country, inasmuch as our motor traffic is ever-increasing. We have almost struggled through another season of dust to find that nothing permanent has been decided upon to alleviate this public malady.

In many places, all kinds of materials and liquids have been experimented with, in the hope of finding out the best and cheapest way to obviate the nuisance—including "Westrumite," "Akonia," slag-tar macadam, etc.; and they all seem to work out too expensively to be undertaken for a general system of dust prevention. In my opinion, the time is now opportune for the doing of something permanent; and I venture to suggest the adoption of coal tar, which, if properly applied to the greater part of our roads used for motor traffic, would prove in the long run to be cheaper and more efficient than any other remedy yet tried. I have no doubt that slag-tar macadam, applied at Battersea, has proved one of the best remedies; but its cost, and the amount of time required to cover the many miles of roads, put it out of court. Then why not take the simplest and cheapest remedy—viz., the application of tar paint to our main roads? By this means all the principal roads could be dealt with so as to last through the season, at a cost not exceeding $225 per mile, and without interfering with the traffic.

I have seen sections of road treated in this manner. It gives a smooth surface, and the coating prevents the suction power of the motor tires from lifting out and depositing grit all along the road. The absence of dust is obvious; and during wet weather mud is conspicuous by its absence. This is bound to give a longer life to the macadam road; and the road will last from 6 to 7 months without showing signs of breaking the crust formed by the application of the tar. The work should be done in hot and dry weather, while the surface of the road is warm, and half the road should be taken at a time.

To carry out this system of tar painting, one portable tank, fitted with firebox, flue and smoke stack, and tar brought up to boiling point are required. After the roads are swept clean of all dust and grit, the tar should be run off into smaller tanks with 1-inch flexible tube attached, with a 2-inch cross spray. It should be put on the roads as hot as possible and laborers should use brooms to brush the tar over the road. After about 8 hours it will be found to have penetrated into the macadam to the depth of at least 2 inches.

It will be found that the portion of the roadway thus done will be available for traffic in the course of about 12 hours. Sand or dust from the road might be spread over where necessary, but only in small quantities, as this tends to eat up the tar, which should penetrate into the road.

I have had a portion of road, 1 mile long and 21 feet wide, done in this manner and find that if the tar is applied hot it will penetrate 2 inches into the macadam. The cost works out as follows:

	Amount.
Price of tar	$102.66
Sweeping	32 76
Hauling and heating tar	15.39
Applying tar	33.55
" " and cost of sand.	38.50
Total	$222.86

I take it that, should all the roads on which motors are run be watered to prevent dust, the cost would be, approximately, $250 per mile, and then the roads would not give the requisite satisfaction. Under the system of tar painting, the results would be durable and less costly. This estimated amount for water may seem a large item; but water is not attainable as easily through the country as it is near the large towns, and this adds materially to the cost in the form of increased charge for transit.

There has been on the part of many local authorities a gradual progression of ideas towards tar, and the results, consequent upon exhaustive experiments, are satisfactory and intensely encouraging. Nothing has been brought forward as yet to show that this treatment is not desirable, and even the stock argument of climatic conditions will not avail in this instance.

As regards the increased expenditure over the somewhat primitive and undesirable method of watering, I may point out some serious waste caused by this disastrous and stupid system. The water cuts channels and washes out the binding, involving the necessity for frequent repair and reconstruction at short intervals, whereas the tar paint, being dustless, requires no watering, and the initial cost involved is quite inconsiderable. Again, expense is saved in the process of cleaning. The cleaning of an ordinary macadam road is ruinous, whereas with the tarred surface suggested the stones are not torn up or disturbed and the road can be swept regularly without the slightest fear of the surveyor's anger, which is so apparent under the old system.

If time permitted, one could say much about the matter from a hygienic point of view. A dissertation on the antiseptic properties of tar and its use as a germicide, would be out of place here; but its value in this connection cannot be gainsaid.

Tar painting of roads has now passed out of the region of demonstration and experiment, and I am of opinion that all interested in gas works would do well to bring this question to the front. The method is certainly the most efficient and economical for dealing with the dust nuisance on a large scale, and its adoption—while it will meet a long felt want for the public, the pedestrian and the cyclist—will provide a new and valuable market for coal tar.

Discussion.

Mr. Thomas Canning did not think any subject of greater importance in these days could have been brought before them than the question of treating roads with coal tar. All who made use of the roads knew what a nuisance the dust raised by motor cars was. Great damage was done by the dust, and he could not but think, looking at the matter from a sanitary point of view, that a great deal of mischief must be done by the raising of dust which was often filled with microbes and infectious matter. It did also great injury to gardens and vegetation generally. The question was almost becoming a national nuisance. In saying this he was not running down motor cars. He believed that, having come into existence, they had come to stay; and this being so, it was necessary that some steps should be taken to do away with the dust nuisance, and he believed that gas people had it in their hands to remedy the nuisance. Therefore, it became their special duty to point it out with as much intelligence as they could. At the last meeting of the Institution of Gas Engineers in London, Sir George Livesey drew attention to this important use for tar, which was a complete reservoir of a large number of valuable products, and yet to-day the price of coal tar remained what it was 50 years ago. Since the meeting referred to, the *Journal of Gas Lighting* had published certain leading articles containing very useful hints, and he would like to refer particularly to the issue for August 28th, in which they would find an article especially dealing with this question well worthy of their attention. Experiments in the treating of roads for the prevention of dust had been carried out in Kent, especially at Folkestone. Here was a town which had been overrun with motor cars. Gardens had been destroyed and visitors driven away, and the only remedy found was the application of the very remedy which they, as gas engineers, had in their hands. Folkestone, since the time, 12 months ago, when it was started, was quite a different place to what it used to be; to-day it was almost a dustless town. In other parts of the country they had also had experiments made. He had read the evidence before the Motor Car Commission that had been given by Mr. H. P. Maybury, formerly a gas manager and now Surveyor to the Kent County Council, in the course of which he said he was still obliged to employ gas tar, but that it must first pass the distiller. He (the speaker) claimed, however, that this gentleman's experience was too limited under the circumstances to come to an *ipse dixit* opinion like that. There were other ways besides distillation. It was for them to ask themselves, could they not treat their tar so as to make it acceptable for this purpose? Could they not in their own districts carry out experiments which would show that gas tar was applicable to the purposes which he had mentioned—namely, prevent dust on main roads? Experiments had been made with coal tar, and the results had been different from those given by Mr. Maybury—and that, too, in the county of Glamorgan. At a recent meeting of the Glamorgan Roads and Bridges Committee, Mr. G. A. Phillips, the Deputy County Surveyor, reported on the experiment of tarring a section of 923 yards of the main road at Bridgend for dust laying. The effect, as far as it had been observed during the

short period since the work had been done, was considered satisfactory, though it was perhaps early to have any recommendations upon the short experience they had had. But the method certainly presented itself as one of the most efficient and economical ways of dealing with the dust nuisance. The cost had been 2 cents per yard. In Cambridge the Council had experimented in a similar way, with satisfactory results. A county road ran through their district, and they offered to treat it with tar for 12 months free of cost to the county if permission were given. Here the cost of treatment was 1 cent per yard. They had had various prices given, from 2½ cents down to 2 cents. It was too early yet to see whether this system was going to go higher or lower; but they had their own ideas that the price might go lower. He said this bearing in mind the possibilities of a machine invented by a very able Frenchman, which covered a lot of ground in a very short space of time. It was being tried, and no doubt a machine of this kind, which spread the finely prepared tar on the road while it was hot, would become a success. It was only a question of time. He felt that this matter was really so important that it should be discussed fully at the meeting. It was for them to make experiments. If they did not mind, the county councils would be purchasing stuff which would spoil the fair fame of coal tar—if it was possible to smirch anything that was already black? He considered that when a good surface was properly put on with coal tar, it would last a considerable time—probably twice as long as any imitation would last; for a tar treated road required less water and in some cases none at all. In some towns the cost of watering the roads was very heavy and in periods of drought there was sometimes great reluctance to water them at all. There were a lot of advantages in the use of coal tar, and it would be to the interest of their business if they made their own experiments and lost no time about it.

Mr. E. Jones (Burslem) said there was really no other subject that was taking the attention of the public at the present time. Referring to the article in the *Journal of Gas Lighting* for August 28, to which Mr. Canning had drawn attention, he (the speaker) thought that some move should be made by the District Institutions to bring the matter before the parent body and that they should do something like the Sulphate Committee were doing in regard to sulphate. It was difficult for gas managers and engineers to deal with this subject by themselves. There were some with a dual position and it was easier for them. When he was in that position, he was able to do something in the way of experiments, not so much with keeping down the dust as with maintaining the roads He had a great fight with the County Council to get a better surface on the road than then existed. The gentleman whose evidence had been referred to said that tar on a road made of limestone was of no use. He had made some experiments, and with regard to what he called coal tar, he said he was still in favor of tar as it came from the gas works, and he added he would take it from the gas tar plant, but that he preferred to have it distilled. He mentioned this because he thought that Mr. Canning had slightly misunderstood the point—a thing that Mr. Canning did not often do. He agreed that the subject was of the greatest value. In many country places, property close to the road was beginning to deteriorate because of the dust. The subject was one which he thought they should pursue to the end, and they should do something to show that they had had the matter under their consideration. They should get the parent Society to do something to bring it before the various authorities; they had certatnly no right to let the industry slip through their fingers.

Mr. Thomas Canning thanked Mr. Jones for his remarks. In the evidence which he had read, it appeared that Mr. Maybury not only preferred distilled gas tar, but also that he said coal tar was useless, as it peeled off. He was glad to hear from the last speaker that in subsequent evidence something quite different had been stated.

Mr. T. Acland (Llanelly) said they had had the question before them at Llanelly for 15 years past, and they had some miles of good roadway there. At the present moment, at the request of his Board, he was carrying out some experiments with regard to the distillation of coal tar. He agreed that the subject was one of the greatest importance, and they must do what was necessary to it to get a good price themselves and to supply authorities needing it. He had watched the make-up of several roads in his district. The first and most important thing was to see that the formation of the road was very good and thoroughly solid; then there ought to be a layer of 4 inches of properly made tar macadam; after this it should be well rolled and then the tar painting was all right. When tar painting was put on a road with an indifferent surface, the tar was wasted; for it had been tried and proved a failure. If it was properly made first and properly painted afterwards they would have a splendid road.

The Supply of Gasoline.[1]

The gasoline question is one of rapidly increasing interest. Though there is much more of the product being taken now than ever before from both oil and gas, the supply is small when considered in relation to the immense demand and to the certainty of greatly increased use of motor machines on land and sea, for which gasoline will be the most likely to be used if it is obtainable. Large as the use of the product now is in gasoline engines, automobiles, boats and the multiplied other ways in which it is consumed, the market for it may be said to be yet in its youth and to be dependent for expansion only on the limits of supply and cost. The price is now rising and undoubtedly will go higher. At present, however, it is the consideration of future supply rather than of cost that is causing special discussion of the subject, notably in Great Britain and the United States, with advocacy of legislation providing for substitutions. While this agitation may not lead to any revolutionary results as affecting the demand for the light products of petroleum, it will be well for the oil man to keep tab on its progress and see that his attitude is not misrepresented.

The chief substitution now proposed both in Great Britain and the United States is what is termed denatured or denaturized alcohol, which is obtainable in varying quantities from grain, fruit, potatoes or any starchy product, the denaturing process consisting in such adulteration as will render it unfit to take internally. The present revenue tax on this alcohol is $2.05 per gallon and the retail price runs at about $3 a gallon. There is now a measure before Congress proposing the removal af the tax on all of this alcohol that is denatured and applied to technical uses, including lighting, heating and motor uses. It will be seen that even with the tax removed there would have to be a considerable further cheapening of the product in this country in order to bring it below present gasoline prices, or even much higher ones. It is argued that it can be produced much cheaper, and in support of this claim emphasis is put upon the following extract from a recent report from Cuba, as made by Minister Squires:

"Matanzas, a city of about 40,000 inhabitants. has water connectiou in 1,700 out of 4,000 houses, which use about 100,000 gallon a day. The water works, operated by an American company incorporated in the State of Delaware, are located a few miles distant from the city, where there are springs giving excellent water in sufficient quantity to supply a city of 100,000 people. The alcohol motor pump, used on Sunday last for the first time, is of German manufacture, and cost, complete with installation, $6,000. This motor pump is a 45-horse power machine and is operated at a fuel cost of about 40 cents an hour, or $4 a day of 10 hours, pumping 1,000,000 gallons of water. As alcohol here is very cheap (10 cents a gallon) the running expences of these motors are at a minimum. The Germans are selling in Cuba many such motors for electric lighting and water plants at very low prices. One firm has a contract to put in an alcohol motor pump at Vento, for use in connection with the Havana water supply, which is expected to develop 180-horse power, to cost, with installation, about $25,000, and to pump 1,000,000 gallons an hour at a fuel cost of $1.60. The same firm has installed an electric plant alcohol motor of 45-horse power which supplies 138 lights (Hersch lamps) at a fuel cost of 5 cents an hour."

In Great Britain the agitation for cheaper alcohol is not new, but is accentuated by the present demands for gasoline, whose consumption in that country is estimated by our London contemporary, the *Petroleum World*, as being now at the rate of about 15,000,000 gallons annually. Noting recent advances in price, the *World* continues: "It is expected that there will be a steady increase in the price of the ligher grades. Unless new sources are discovered, the available supply cannot prove equal to the enormous and ever-growing demand now made upon it. It is computed that at present close on 15,000,000 gallons of petrol are consumed annually in this country, and in the near future the consumption will increase enormously. Estimating that 500 motor omnibuses will shortly be in commission, and that they run 100 miles a day for 300 days per annum, and use a gallon of petrol per 5 miles, the consumption under this head alone would amount to 3,000,000 gallons per annum."

The *Oil and Colorman's Journal*, of London, in recurring to this subject says: "It is unquestionable that petroleum will not long suffice to produce the quantities of motor spirit which will be required; for the petroleum resources of the world bear no comparison to the coal resources, and are not by any means to be considered as inexhaustible. It will, therefore, be necessary soon to consider whence we are to obtain a world supply of motor car spirit; and there would seem to be no

1. *Petroleum Gazette.*

answer to the question, except in connection with that other question relating to the freeing of alcohol from legislative restrictions. We have dealt with this point before, but mainly with regard to the interests of the color trade. A powerful lever with which to move recalcitrant governments will be given to us if it can be shown that the development of the motor trade and of motor traffic is impeded by the lack of suitable motive power for explosion engines. And, moreover, the trouble will touch the pockets of the wealthy and governing classes—a point which is of considerable importance in the matter of reforms of all kinds. With free alcohol a very large supplementary source of supply will be opened up; for alcohol suitable for the explosion engine can be produced at very low rates from a vast variety of cheap materials. Incidentally, a great boon will be secured by many of our manufacturing interests, and it will be well for all those who are concerned in the matter to put their heads together and see what can be done to hasten on the change. There is one other point which may be borne in mind, viz.: That we are, as things stand, in absolute dependence upon foreigners for the motive power at present in use." The *Journal* concludes by pointing out, in effect, that if a change should be made to the manufacture of motor spirit from native instead of foreign materials, it could be made at home as well as abroad; that there is practicularly a large scope for such manufacture in the Emerald Isle, and that one of the beneficent results might be to enable Ireland to find additional sources of revenue to turn over in part to absentee landlords and in part to the maintenance of the horde of official leeches that England is still permitting to keep fastened upon that country. This, of course, is not the *Journal's* way of putting it, bnt an off-hand interpretation of its expression of patronizing solicitude for "the distressful country."

In speaking of the gasoline supply and the agitation for denaturized alcohol our Chicago contemporary, the *Paint, Oil and Drug Review*, says: "Gasoline is not yet a costly article but the demand is so great and the sources of supply so uncertain that the question of a substitute is already being considered. The automobile industry is only in its infancy, and the power boat craze has hardly begun to make itself felt as yet. When both these sports arrive at their maturity they will consume an immense amount of motor spirit of some kind, and the question is, what shall it be? Of course the obvious answer is, denaturized alcohol, but that is still dependent on legislation for its very existence in this country. The practical difficulty in any effort that may be made toward increasing the supply of gasoline is that the high grade crude oils from which the largest percentage of gasoline is obtained are declining in production. Possibly some improvements in distillation may be effected that will make good the threatened shortage, but at present the prospect for a decreased supply of gasoline as compared with the demand seems to be worth considering."

The present status of the congressional measure referred to is that the members of the committee on ways and means, with the exception of Grosvenor and Dalzell, have voted to report the bill favorably. If passed by Congress it is to go into effect 3 months from the date of its passage, the details of its administration to be left to the treasury department. The oil men do not appear to feel much concerned over the measure, but it is strongly opposed by the wood alcohol manufacturers, who are not reassured by the explanation that their product may be used in the denaturizing of the grain alcohol.

Coal Tar Paint.[1]

The disposal of coal tar to the best advantage, and its utilization for purposes for which it has not hitherto been largely employed, are subjects which have been so much under consideration lately, that attention may be directed to some experiments bearing upon its use in the production of a protecting paint for ironwork. They were carried out by Mr. A. C. Cunningham, of the United States Navy, who, while on the New Orleans Naval Station, noticed that when the Southern Pacific steamers entered the port their hulls, from the water line for a considerable distance up, were painted with ordinary coal tar. Further inquiry brought the information that tar was quite commonly used on the bottom of craft in the New Orleans section; and in the "Journal of the American Society of Naval Engineers" recently Mr. Cunningham gave some interesting particulars on the subject.

While the tar was under observation, a patented coal tar paint was offered for sale on the station at 50 cents per gallon. It had the appearance of a high-grade asphaltum paint; but examination of the formula by which it was made showed that it consisted of coal tar with some twenty different substances added in various proportions, evidently in no scientific manner. The substances constituted two groups, one of which was a dryer and the other an acid neutralizer. With this information as a basis, and the tradition that lime would neutralize the acids in coal tar, which are supposed to be injurious to iron or steel, experiments were made to develop a paint, using turpentine as a dryer. They were a failure. It was found that the lime, whether quick or slaked, spoiled the mixture, and the result was a non-lustrous coating of no durability.

In the next series of experiments, Portland cement was substituted for lime; the turpentine still being used. An improvement in results was secured, but the paint was not entirely satisfactory. At this stage of the proceedings, information was received that common kerosene oil would act as a dryer to coal tar. Further tests were started on this basis, and the desired results were reached.

The final mixture was tested by the Government Chemist at the Washington Navy Yard, and pronounced non-injurious to iron and steel. The tests of the mixture were carried still further by Mr. Cunningham while stationed at the Naval Academy, and a perfected method of mixing developed. The proportions of the mixture are slightly variable, according to the original consistency of the tar, the use it was intended for, and the climate in which it was to be used. In general, it will vary between the following proportions, by volume:

	Coal Tar.	Portland Cement.	Kerosene Oil.
New Orleans mixture	8	1	1
Annapolis mixture.....	16	4	3

The portland cement should be first carefully stirred into the kerosene oil, forming a creamy mixture. This mixture is then carefully stirred into the coal tar. To obtain the best results, it should be freshly mixed and kept well stirred.

With this tar paint, old leaky tin roofs at the Naval Academy, on buildings that were to be taken down in the course of 2 or 3 years, were made water tight. On the worst places, a coat was applied; then muslin was stretched over the wet paint; and after drying an additional coat of paint was applied over the muslin. Temporary sheds that were covered with tin taken from the demolished buildings had their roofs made water tight and sightly.

This coal tar paint is the only mixture that Mr. Cunningham has ever found that will unquestionably stick to and thoroughly cover galvanized iron. The cost of the paint will vary from 10 cents to 15 cents per gallon; and when it is considered that even a fair linseed oil paint will cost from 80 cents to $1 per gallon, the great economy is apparent. Linseed oil paints have no durability in salt water or in a very salt atmosphere, on account of the solvent action between the salt and the linseed oil. The tar paint, however, being composed of purely mineral materials, is quite stable, and much more durable under the same conditions. The purity of paint materials is a subject in itself; but as regards the coal tar paint, the materials are so inexpensive in themselves that no adulteration need be feared.

It goes without saying that a metallic surface that is to be painted should be as clean and free from scale as possible. New iron from a mill is generally painted too soon, as the mill scale is very tenacious for a long time, but will ultimately come off and bring the paint with it. A rust scale is as bad to paint over as mill scale. A light newly formed rust is not injurious to paint over, provided there is not too much for the paint to reach the metal proper. The theory that when any rusted surface is painted over, the oxidation will continue on into the metal without extraneous assistance, is, on the face of it, erroneous, as iron oxide is a very stable combination. The conditions for rusting require the presence of both air and moisture. In dry air or pure water, iron will not rust. Painting over a rust scale insures the contact of a porous layer containing both air and moisture against the pure metal; and rust scales continue to form under the most favorable conditions until the swelling of the oxide causes the whole to fall off. The black surface which then appears is sometimes mistaken for the mill surface of the metal.

Mr. Cunningham does not make any unusual claims for coal tar paint; but he believes that it is better than most cheap paints of unknown origin and materials. It has been sufficiently demonstrated that it is of some value, its low cost is attractive, and in emergencies it might be of great use.

1. *Journal of Gas Lighting.*

The Question of Advertising Charge to Secure New Business.

At the last meeting of the National Electric Light Association the "Question Box" furnished many excellent queries for discussion. Regarding the question, "What percentage of gross receipts should be used for advertising in a city of 10,000 to 12,000 inhabitants?" the answers received thus sum up:

This depends entirely on how the field has been previously worked. If the business has not been developed, spend as much as you can stand. Every new customer increases the earning value of your property by $100. Two per cent. should bring splendid results. Two per cent. of gross receipts, or charge part of superintendent's time to advertising. The percentage of gross receipts that should be expended on advertising

varies largely. Where a solicitor or solicitors are employed more money can be afforded for advertising than if the solicitors were not employed, for money spent in advertising will be invested to much better advantage if the resultant inquiries are followed up by solicitors. I firmly believe in advertising, from my boot soles up, but I don't have any false views on it. Advertising, considered purely alone—even the very best kind of advertising—direct mail solicitation—will not pay a heavy return on an investment unless it is used directly in connection with and followed up by personal solicitation. So, in this answer, I assume that the question of the percentage of expenditure of the gross receipts on advertising means when advertising is properly done in connection with solicitation, so as to get the highest efficiency in resultant new business. The largest volume of returns thorugh advertising secures business that would not otherwise be obtained immediately, and in many cases business that would not come "naturally"—that is, without the exertion of advertising solicitation—until after several years, the net income meantime obtained through advertising would in most instances pay for the advertising many times over. Thus, if a customer for a sign is secured through direct mail solicitation and the annual revenue is $60, then, if we assume that the customer would have come on "naturally" at the end of 5 years, the central station has secured a gross income of $300, and in the meantime the net profit would have paid many times over the cost of the advertising plus the cost of solicitation. The expenditure of money for an advertising appropriation where the company is prepared to back up the advertising by solicitation, and carefully and conscientiously take care of the customers secured—promptly and efficiently—should be based, not on a percentage of the gross receipts, but contrariwise, should be every cent that the central station can get to put into this vehicle for expanding its business. Advertising secures new customers. New customers should be considered as an investment and should be paid for and charged to investment account just as surely as though the company had purchased the customers from another company. So far as getting the customer is concerned, where is the difference between buying them from another company or going to the expense of purchasing them through advertising? In either case the customers have to be paid for, and it seems wrong to charge them in one instance to expense account and in the other instance charge them to the investment account. Surely, if an electric light company is willing to pay from $50 to $150 each for new customers, even from a competing local company, then it ought to be willing to pay anywhere from $2 to $10 each for the same class of customers through advertising in a little town. Just as surely as they would charge the purchase price to the investment account in the first instance, they ought to charge the smaller amount to the investment account in the latter instance. I believe this statement to be a logical one from a conservative viewpoint, and I believe that, while it is not now generally done, it will be done within a few years, just as is done in other businesses which have advertised for a good many years, where the advertising is done for the purpose of securing customers, which, in a majority of cases, remain as constant customers year after year. This latter point should be held strongly in mind as differentiating central station advertising from a class of advertising where the resultant business is only a desultory sale, in which instance there is not a constant income from the customer, but the profit is all made on one sale.

Let the reader think this over and, before condemning the stand, find any flaw in the argument. It is true that when customers are purchased from another company the apparatus and copper for serving the customers are also purchased. Even then, deducting the cost of the material necessary to serve the customers, it will be found that the price paid for each customer is largely in excess of what it would cost to procure that customer through advertising. Consequently, the inference seems a plain one that new business obtained through advertising should not be handicapped by charging the cost of obtaining it to expense account when the expense of obtaining a similar customer would be charged to the investment account of the customer were purchased from another company. Smaller cities of from 10,000 to 12,000 inhabitants can get a more profitable return on money expended on advertising than is the case in the larger cities, because the customer in the smaller towns can have more effect produced on his mind by a small expenditure of money than his busier brother in the large city. It is true that in the smaller town the new money is not always forthcoming to purchase the new customer, either by advertising or outright purchase from another company, and in that event as large a percentage as possible of the gross receipts should be expended on the procurement of new business. No two cases are the same, and no fixed percentage of gross receipts can be set down as a rule to be followed in individual cases where local receipts and conditions may vary widely. There is no manufacturing business in the world in which the percentage of fixed charges and general expenses so rapidly decreases as in the production of electricity. Consequently, every effort should be bent and every cent possible should be expended toward increasing the number of profitable customers.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. J. C. KROUSE has been appointed Deputy Gas Inspector, vice the late Mr. J. T. Ford, by the Richmond (Va.) City Council.

AT the annual meeting of the Holland (Mich.) Gas Company the officers chosen were: President, John A. Covode; Vice-President, Jacob E. Van Putten; Secretary, Joseph Bremer; Treasurer, W. E. Raiguel. The annual reports showed a satisfactory increase in the Company's trading.

"P. T. W.," writing from Baltimore, Md., under date of the 20th inst., incloses the following: "An illustrated lecture was given this week in the offices of the Baltimore Gas and Electric Company, the subject being the 'Efficient Distribution of Light, and the Best Use of Shades and Reflectors.' The lecturer was Mr. A. J. Marshall, of the Holophane Glass Company, who spoke to an appreciative audience, composed of electrical contractors, architects, members of the American Institute of Electrical Engineers, solicitors of both the gas and electric departments of the Baltimore Company and a large number of its patrons."

WE understand that the Elmira (N. Y.) Water, Light and Railroad Company is making rapid progress in the matter of the final preparations for the purchase and control of the Chemung County Gas Company and other extension of its interests. Messrs. Parker, Hatch & Sheehan, as Attorneys, have applied to the State Railroad Commission for consent to enlarge the Company's interest in respect of its railroad division and later will apply to the Gas and Electricity Commission for sanction to extend its lighting division operations. The request already made is for consent to issue first consolidated mortgage bonds for $5,000,000. The proceeds are to be thus applied: (1.) To retire the $3,200,000 principal amount of bonds, secured by mortgage. (2.) To acquire capital stock of the Chemung Gas Company. (3.) To retire the first mortgage bonds of the West Side Railroad Company, dated Oct. 1, 1914. (4.) To acquire additional property and to pay for future additions, extensions and betterments of the Company's present plant and property. The Company has also asked the Commission for authority to increase the capital stock from $1,000,000 to $2,000,000."

THE proprietors of the Standard Gas Company, of Keyport, N. J., have applied to the authorities of Atlantic Highlands for the right to supply gas to the residents thereof. The authorities have not taken action in the premises as yet, but we understand are inclined to agrée to the proposal, provided the Company will bind itself to charge not in excess of $1 per 1,000 cubic feet, and agrees not to compete with the borough electric lighting plant in respect of street lighting or the illuminating of the public buildings.

THE mains of the Western United Gas and Electric Company, o Aurora, Ills., have been extended to Carpentersville, through East Dundee, and later on the Company will put its pipes through Algonquin.

MR. W. H. MCGOLDRICK, of San Antonio, and his associates, have about completed their arrangements for the construction and operation of a gas plant at Abilene, Tex. They are to work under the terms of the franchise that was granted last spring.

MR. B. H. SPANGENBERG, whose service in varying capacities with the United Gas Improvement Company dates back to 1890, and who since 1902 has been Superintendent of Meters for that Company in Philadelphia, has resigned from its service to accept the position of Engineer and General Manager to the Rotary Meter Company, with headquarters in New York city. He assumes his new duties to-day. Mr. Spangenberg has an excellent reputation for ability and skill as a constructor and operator of gas works, but he is probably best known to the gas world at large through his original research and practical work in connection with gas meter construction. As the Manager of the meter division of the U. G. I. Company's business, he had the employing and directing of 150 or more skilled mechanics, and during the past few years several "large capacity" meters of the consumers' type, designed by him and constructed under his immediate supervision, have been practically at work in the distribution system of several operations directed by the U. G. I. Company. It is, of course, well in the minds of our readers that Mr. Spangenberg, at the 32d meeting of the American Gas Light Association, held in Washington in 1904, read a paper en-

titled "Consumers' Meters," which was remarkable in many respects. In fact, its merit and exhaustiveness as well were such that it gained for its author an award of the Beal medal. The text of the paper and the discussion thereon will be found in our issues dated November 14, 21, 28; December 5 and 12, 1904. Also in Vol. 21, "Proceedings" American Gas Light Association, Appendix, pp. IV. to XCI. Mr. Spangenberg is in every sense thoroughly qualified to assume the duties of his present position.

MR. FRANK W. SHUBERT, formerly in the service of the New Orleans (La.) Gas Company, died at his home in that city the evening of September 14th. He was in his 53d year, having been born in New Orleans, October 20th, 1853.

THE new holder for the Pensacola (Fla.) Gas Company, the rated capacity of which is 200,000 cubic feet, is in commission.

WE are indebted to the courtesy of Mr. Edward J. O'Beirne for the names of those elected to direct the affairs of the American Public Works Association for the ensuing year: President, R. C. Huston, C.E., Hattiesburg, Miss.; Vice-Presidents, M. F. Cole, Newman, Ga., Chas. C. Wilson, Columbia, S. C., and George O. Tenny, Spartanburg, N. C.; Secretary, W. H. Flint, Chattanooga, Tenn.; Treasurer, Morgan Llewellyn, Chattanooga, Tenn.; Chairman Executive Committee, Edward J. O'Beirne, Atlanta, Ga.

WE regret to report the death of Mr. John F. Eagan, senior member of the firm of Eagan & Calhoun, a well-known plumbing house whose headquarters are on Congress street, Troy, N. Y. His death occurred the morning of the 18th inst. He was born in Cambridge, Mass., July 22, 1846, and removed to Troy when in his 15th year. Some years ago he had charge of the fitting department of the business of the old Schenectady (N. Y.) Gas Light Company. He also served the Troy Gas Company in similar capacity for quite a while. He was Financial Secretary of the Troy Plumbers' and Steam Fitters' Union, No. 61, since the organization of that body.

THE Aero Club, of New York, has bargained with the Pittsfield (Mass.) Coal Gas Company to furnish the gas necessary for the filling of a balloon that is to make several ascensions next week in the vicinity of the Berkshire Hills. A number of ascensions were made from the yards of the Pittsfield works last spring, all of which were very successful. "A filling" requires the taking in of 150,000 cubic feet of gas.

THE Directors of the Nashville (Tenn.) Gas Company recently adopted the following resolutions respecting the memory of their late President, the Honorable Thomas H. Malone:

"The Directors of the Nashville Gas Company have learned with sorrow of the death of the honored President of the Company, Thomas H. Malone.

"As President of the Nashville Gas Company Judge Malone displayed those high qualities of mind and heart which had marked his career as a citizen, a soldier, a lawyer and a jurist. Faithful to every trust imposed upon him in all walks of life, he conducted the important and difficult duties connected with the administration of the affairs of this Company with the ability, fidelity and integrity which were such marked characteristics of his personality.

"His incumbency of the office of President covered a critical period in the Company's history, involving the decision of questions of the greatest moment. To these arduous duties he presented an unflinching front, and to his signal ability and untiring labors in its behalf are due the large measure of success which has attended the operation of the Company.

"To the Directors of the Nashville Gas Company his loss is irreparable. Therefore, be it

"*Resolved*, That in the death of Thomas H. Malone the Directors of the Nashville Gas Company recognize the loss of a beloved leader, colaborer and friend, and that we extend to his bereaved family our most profound sympathy in their deep sorrow.

"*Resolved*, Further, that these resolutions be spread upon the minutes of the Company, and a copy furnished the family of the deceased."

THE promoters of the Waycross (Ga.) Gas Company, who are said to be capitalists at Tallahassee, Fla., aver that the plant will be constructed immediately.

THE Lawrence (Mass.) Gas Company is offering its shareholders the right to subscribe to 4,000 shares of new stock, at $120 per share, on the basis of 2 shares of the new to each 5 shares of the old, as per holders of record on the books.

THE plant of the Hillsdale (Mich.) Gas Company is being "gone over" in many details, which practice is in keeping with the usual up-to-date methods of the Messrs. Lloyd.

WORK on the new gas plant for Iron Mountain, Mich., is underway. Amongst those prominent in the ownership of the Company may be mentioned Mr. W. G. McIntosh, of Detroit, and Messrs. Andrew Fife and A. H. Wallace, of Grand Rapids, Mich. The offices of the Company are in the Union Trust Building, Detroit. Mr. A. W. Glass is its Secretary.

AT the annual meeting of the shareholders in the St. Joseph (Mo.) Gas Company the following results were reached in the election for officers: Directors, Emerson McMillin, James Campbell, L. C. Burnes, W. P. Fulkerson, M. A. P. McDonald, John Donovan, Milton Tootle, Jr., Henry Krug, Jr., and C. A. Pfeiffer; President, E. McMillin; Vice-President, W. A. P. McDonald; Secretary and Treasurer, Ferd. Labrunerie; General Manager, K. M. Mitchell.

MR. JAMES MACKIN, for some time a valued member of the office staff of the Peoples Gas and Electric Company, of Oswego, N. Y., has become a partner with Mr. John H. Snyder in the Oswego Electric Supply and Construction Company. His successor in the gas office is Miss Bessie Watts, of Watertown, N. Y.

SUPT. C. F. CATTELL has his time pretty well occupied just now in completing the betterments on the manufacturing and distributing divisions of the Chester County (Pa.) Fuel and Light Company. A route for the supply main between Avondale and Kennett, passing through Toughkenamon, has been selected, and the main will be completed and ready for operation by October 20th. The new manufacturing plant will be ready for running by the end of the year.

THE connecting main from the plant of the North Attleboro (Mass.) Company to the Plainville District will be finished by October 25th.

IF the "pictures" thereof as shown in the Eau Claire (Wis.) *Leader* of recent date, may be accepted as accurate, the new office building for the Eau Claire Gas Company will be a beauty. The dimensions are 40 feet front by 105 feet in depth, and the height is 24 feet, in 2 stories. The material for the fronting is "pressed fancy" brick, with stone trimmings, and the entire architectural design is ornate, but not to the point of dwarfing substantiality. The building will be ready for occupancy by May 1st next.

THE proprietors of the Kingston (N. Y.) Gas and Electric Light Company have agreed to reduce the selling rate from $1.40 to $1.25 per 1,000 cubic feet, with a discount for prompt payment of 10 cents per 1,000. The concession is to become effective November 1st.

MR. HENRY E. MORTON has been succeeded as Superintendent of the Fort Dodge (Ia.) Light and Power Company by Mr. Henry J. Clark.

THE proprietors of the Wallingford (Conn.) Gas Light Company report this as the banner year in the corporation's history in the instance of placing gas stoves. Over 2 carloads were placed.

ANOTHER record breaker narrative in the field noted above comes to us from Springfield, Ills., in which bustling city stoves to the number of 920 had been put out this year, up to date of September 25. The Company put down 6 miles of mains this season, and 157 houses were piped for a gas supply.

AT the annual meeting of the Colorado Electric Light, Power and Railroad Association, which was held in Denver, Col., the third week in September, the officers elected were: President, George B. Tripp; Vice-President, W. G. Matthews; Secretary and Treasurer, J. F. Dostal; Chairman Executive Committee, Frank W. Frueauff. The meeting proper (the Association was organized in 1903, mainly through the well-directed efforts of Mr. Henry L. Doherty) was most interesting and successful.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance.
Single copies, 10 cents.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 3) Lime Street, London.

MONDAY, OCTOBER 1, 1906.

The Market for Gas Securities.

During the week Consolidated, on light trading, sold off something over 2 points, but the loss subsequently was about all recovered. It opened to-day (Friday) at 139 to 139¼. The business of the Company is positively enormous, and it will be hard put this winter to supply the demands that will be made on it. Brooklyn Union is unchanged.

Peoples, of Chicago, is fairly steady, and the same may be said of Baltimore Consolidated. Massachusetts gas, common, is inclined to make higher prices. The figures for Washington (D. C.) gas are unchanged. At anything under 300 the stock looks a purchase.

Gas Stocks.

Quotations by George W. Cloos, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	139	139⅛
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1s Mtg. Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con. 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg, 5's due 1939, M. & N.	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	120	130
1st Con. 5's, due 1948, M. & N.	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	101	101¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107¼	108
Consumers, Toronto	2,300,000	50	200	204
Consolidated, Baltimore	11,000,000	100	80	90
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co.	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	96½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	38
Bonds, 1st 5's	3,823,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	60	60⅛
Preferred	25,000,000	100	88	88⅛
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	88¾	89⅛
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104⅛	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	285	290
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600.000	50	230	..

Advertisers' Index.

GAS ENGINEERS.

	Page
A. E. Boardman, New York City	594
Baxter & Young, Detroit, Mich	611
B. E. Chollar, St. Louis, Mo	604
Cruse-Kemper Co., Philadelphia, Pa	600
Davis & Farnum Mfg. Co., Waltham, Mass	612
Economical Gas Apparatus Construc'n Co., Toronto, Ont	594
Frank D. Moses, Trenton, N. J	612
Fred. Bredel Co., Milwaukee, Wis	610
Frederic Egner, Washington, D. C	616
H. M. Byllesby & Co., Chicago, Ills	599
Humphreys & Glasgow, New York City	613
Isbell-Porter Co., Newark, N. J	600
J. F. W. Jost, Philadelphia, Pa	601
Kerr Murray Mfg. Co., Fort Wayne, Ind	607
The Gas Machinery Co., Cleveland, O	596
The Jeffrey Manufacturing Co., Columbus, O	610
United Gas Improvement Co., Philadelphia, Pa	607
Western Gas Construction Co., Fort Wayne, Ind	620

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, New York City	594
Bartlett, Hayward & Co., Baltimore, Md	613
Baxter & Young, Detroit, Mich	610
Connelly Iron Sponge & Governor Co., New York City	609
Continental Iron Works, Brooklyn, N. Y	614
Cruse-Kemper Co., Philadelphia, Pa	600
Davis and Farnum Mfg. Co., Waltham, Mass	612
Deily & Fowler, Philadelphia, Pa	616
Economical Gas Apparatus Construc'n Co., Toronto, Ont	594
Frank D. Moses, Trenton, N. J	612
Fred. Bredel Co., Milwaukee, Wis	610
G. Shepard Page's Sons, New York City	611
Humphreys & Glasgow, New York City	613
Isbell-Porter Company, New York City	600
Kerr Murray Mfg. Co., Fort Wayne, Ind	612
Lloyd Construction Co., Detroit, Mich	612
Logan Iron Works, Brooklyn, N. Y	606
Quintard Iron Works, New York City	613
R. D. Wood & Co., Philadelphia, Pa	614
Riter-Conley Mfg. Co., Pittsburgh, Pa	615
Stacey Mfg. Co., Cincinnati, O	615
The Gas Machinery Co., Cleveland, O	596
The Jeffrey Manufacturing Co., Columbus, O	610
United Gas Improvement Co., Philadelphia, Pa	607
Western Gas Construction Co., Fort Wayne, Ind	620

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md	613
B. E. Chollar, St. Louis, Mo	604
California Light and Fuel Co., San Francisco, Cal	614
Economical Gas Apparatus Construc'n Co, Toronto, Ont	594
Fred. Bredel Co., Milwaukee, Wis	610
Humphreys & Glasgow, New York City	613
The Gas Machinery Co., Cleveland, O	596
United Gas Improvement Co., Philadelphia, Pa	607
Western Gas Construction Co., Fort Wayne, Ind	620

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N. Y	614
Cruse-Kemper Co., Philadelphia, Pa	600
Davis & Farnum Mfg. Co., Waltham, Mass	612
Economical Gas Apparatus Construc'n Co., Toronto, Ont	594
Fred. Bredel Co., Milwaukee, Wis	610
Isbell-Porter Co., Newark, N. J	600
Kerr Murray Mfg. Co., Fort Wayne, Ind	612
Logan Iron Works, Brooklyn, N. Y	606
R. D. Wood & Co., Philadelphia, Pa	614
Riter-Conley Mfg. Co., Pittsburgh, Pa	615
Stacey Mfg. Co., Cincinnati, O	615
The Gas Machinery Co., Cleveland, O	596
Western Gas Construction Co., Fort Wayne, Ind	620

PRODUCER POWER PLANTS.

Economical Gas Apparatus Construc'n Co., Toronto, Ont	594
R. D. Wood & Co., Philadelphia, Pa	614

TAR AND CARBONIC ACID EXTRACTOR.

Economical Gas Apparatus Construc'n Co., Toronto, Ont	594
Fred. Bredel Co., Milwaukee, Wis	610
Isbell-Porter Co., Newark, N. J	600
Kerr Murray Mfg. Co., Fort Wayne, Ind	612
Stacey Mfg. Co., Cincinnati, O	615
The Gas Machinery Co., Cleveland, O	596
Western Gas Construction Co., Fort Wayne, Ind	620

AMMONIA CONCENTRATORS.

Fred. Bredel Co., Milwaukee, Wis	610
Kerr Murray Mfg. Co., Fort Wayne, Ind	612
Michigan Ammonia Works, Detroit, Mich	594
The Gas Machinery Co., Cleveland, O	596
Western Gas Construction Co., Fort Wayne, Ind	620

GAS METERS.

American Meter Co., New York and Philadelphia. 619
Detroit Meter Company, Detroit, Mich..... 619
D. McDonald & Co., Albany, N. Y..... 617
Helme & McIlhenny, Philadelphia, Pa..... 619
John J. Griffin & Co., Philadelphia, Pa. 576
Keystone Meter Co., Royersford, Pa..... 618
Maryland Meter and Mfg. Co., Baltimore, Md..... 618
Metric Metal Co., Erie, Pa..... 617
Nathaniel Tufts Meter Co., Boston, Mass..... 616
New York Improved Meter Co., New York City 618
Pittsburgh Meter Co., Pittsburgh, Pa..... 617
Rotary Meter Co., New York City..... 595

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 619
D. McDonald & Co., Albany, N. Y..... 617
Helme & McIlhenny, Philadelphia, Pa..... 619
John J. Griffin & Co., Philadelphia, Pa..... 576
Keystone Meter Co., Royersford, Pa..... 618
Nathaniel Tufts Meter Co., Boston, Mass..... 618
New York Improved Meter Co., New York City..... 618
Pittsburgh Meter Co., Pittsburgh, Pa..... 617

PREPAYMENT METER ATTACHMENTS

New York Improved Meter Co., New York City 618
Reeves Mfg. Co., New Haven, Conn. 615

WATER METERS.

Pittsburgh Meter Co., Pittsburgh, Pa..... 617

GAS AND WATER PIPES.

Davis & Farnum Mfg. Co., Waltham, Mass..... 612
Donaldson Iron Co., Emaus, Pa..... 604
Economical Gas Apparatus Construc'n Co., Toronto, Ont. 594
R. D. Wood & Co., Philadelphia, Pa..... 614
Warren Foundry and Machine Co., New York City..... 604

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 610
Perkins Co., New York City..... 610
Westmoreland Gas Coal Co., Philadelphia, Pa 611

SPECIALTIES FOR OIL AND PIPE LINES.

S. R. Dresser, Bradford, Pa..... 598

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., New York City..... 604

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y..... 598

GAS TAPPING MACHINES.

George Light, Dayton, O..... 604
H. Mueller Manufacturing Co., Decatur, Ills..... 597

CANNEL COALS.

Perkins & Co., New York City..... 610

STOKING MACHINERY.

G. A. Bronder, New York City..... 611

CONVEYORS.

Cruse-Kemper Co., Philadelphia, Pa..... 600
C. W. Hunt Company, New York City..... 601
Dodge Coal Storage Co., New York City..... 604
Economical Gas Apparatus Construc'n Co., Toronto, Ont 594
Fred. Bredel Co., Milwaukee, Wis..... 610
G. A. Bronder, New York City..... 609
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 612
Link-Belt Co., Philadelphia and Chicago..... 601
The Gas Machinery Co., Cleveland, O..... 596
The Jeffrey Manufacturing Co., Columbus, O..... 610
Western Gas Construction Co., Fort Wayne, Ind..... 620

CHARGING BARROWS & COAL WAGONS.

Davis & Farnum Mfg. Co., Waltham, Mass..... 612
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 612
Stacey Mfg. Co., Cincinnati, O..... 605

GAS ENRICHERS.

Standard Oil Co., New York City..... 611
Sun Company, Pittsburgh, Pa..... 611
The Sun Oil Co., Pittsburgh, Pa..... 611

COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 611
Fred. Bredel Co., Milwaukee, Wis..... 611
The Jeffrey Manufacturing Co., Columbus, O..... 610

GAS METER CONNECTIONS.

H. Mueller Manufacturing Co., Decatur, Ills 597

GAS COCKS.

H. Mueller Manufacturing Co., Decatur, Ills..... 597

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 596

GAS GOVERNORS.

Chaplin-Fulton Mfg. Co., Pittsburgh, Pa..... 593
Connelly Iron Sponge & Goverrnor Co., New York City. 609
Fred. Bredel Co., Milwaukee, Wis. 610
Isbell Porter Co., Newark, N. J..... 600
Johnson-Reynolds Co., Anderson, Ind..... 611
Pittsburgh Meter Co., Pittsburgh, Pa..... 617
R. D. Wood & Co., Philadelphia, Pa..... 604

CEMENTS.

C. L. Gerould, Pittsburgh, Pa..... 608

(*Continued on page 594.*)

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Sept. 12, 1906.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1906, to stockholders of record at the close of business, Sept. 29, 1906. Checks will be mailed.

1632 4 LEWIS LILLIE, Treasurer

Estimates furnished for the erection of complete gas works or the extension and modernizing of old works. All work warranted. Both water gas and coal gas.

EMPIRE GAS IMPROVEMENT & CONSTRUCTION COMPANY,
1623-tf 49 Wall Street, New York.

POSITION WANTED.

A young man, 25 years of age, with 10 years' experience in operating coal and water gas works, and familiar with various branches of the business, desires a position with some company that will appreciate worth and ability, with prospects of promotion. Salary secondary consideration.

Address, "POSITION,"
1633-1 Care this Journal.

WANTED,

Situation as Superintendent of Gas Company,

By a young man 33 years of age. Have had 15 years' experience in the manufacture and distribution of coal and water gas. Am now superintendent of gas company in Southern Indiana. Can give good reason for leaving present position. Am hustler for new business and can furnish the best of references. Address, "L. B.,"
1634-1 Care this Journal.

Situation Wanted.

A Capable, Energetic Young Man Desires a Situation as Manager or Superintendent of a Gas Plant

In a city of not less than 10,000. Has had practical experience in all branches of the manufacture and distribution of gas and extensions and office management. Best of references. Address, "BOX D. W.,"
1634-2 Care this Journal.

POSITION WANTED.

An all-round gas man, with 20 years' experience, is looking for an opening with some gas company. Address, "M. J. W,"
1634-1 Care this Journal.

WANTED,

A Thoroughly Experienced Indexer,

By a company operating within 5 miles of New York city. Address, stating age, experience, and salary expected,
1631-1 Address, "S. H. M." care this Journal.

WANTED,

By a leading manufacturer of an established line of gas ranges, a capable traveling salesman for Western territory. Must have thorough knowledge of the business and acquaintance with gas companies and their affiliations. Information as to age, experience, etc., required. Address, THE MICHIGAN STOVE CO.,
1631-tf CHICAGO, ILLS.

WANTED.

A gas and electric engineer desires a position as engineer or manager. Good record and references.

1634-1 Address, "A B. C.," care this Journal.

WANTED,

A Gas Maker Thoroughly Familiar with the Operation of a 7-Foot 6-Inch Lowe Water Gas Set,

In a plant within 5 miles of New York city. Address, stating age, experience, and salary expected, "S. H. M.,"
1634-1 Care this Journal.

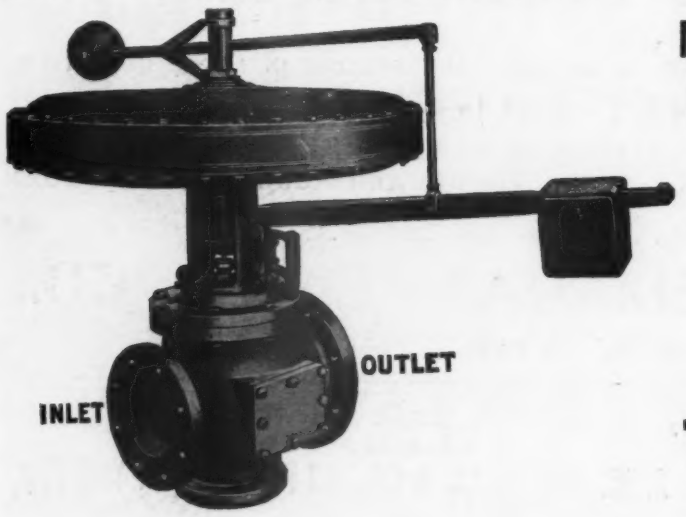
FOR SALE.

Two Complete Sets Water Gas Apparatus, Merrifield Westcott Pearson setting; capacity, each 200,000 cubic feet per diem, in good condition.

Also One Set Cast Iron Purifying Boxes, consisting of 4 boxes 20 feet x 20 feet, complete, with Walker center valve and cover lifting apparatus; 16 inch connections, in good condition.

For prices and further particulars apply to

THE MONTREAL LIGHT, HEAT AND POWER CO.,
1631-4 MONTREAL, CANADA.



The Fulton Pressure Regulators

FOR NATURAL OR MANUFACTURED GAS.
FOR HIGH PRESSURE OR SERVICE USE.

OUR DUPLEX SENSITIVE GOVERNOR for district service will reduce high pressure gas to inches of water without variation. More than 20 years' experience with the largest Gas Companies.

SEND FOR LATEST CATALOGUE.

THE CHAPLIN-FULTON MFG. CO.,
28-34 PENN AVE., PITTSBURGH, PA.

(Concluded from page 593.)

RETORTS AND FIREBRICKS.

Baltimore Retort and Firebrick Co., Baltimore, Md... 608
Brooklyn Firebrick Works, Brooklyn, N.Y. 606
Gas Bench Construction Co., St. Louis, Mo. 608
Henry Maurer & Son, New York City 608
James Gardner, Jr., Co., Pittsburgh, Pa. 608
J. H. Gautier & Co., Jersey City, N. J. 608
Laclede Firebrick Mfg. Co., St. Louis, Mo. 596
Missouri Firebrick Co., St. Louis, Mo. 608
National Pyrogranit Co., New York City 608
Parker-Russell Mining and Mfg. Co., St. Louis Mo.... 609

INCLINED RETORTS.

Baltimore Retort and Firebrick Co., Baltimore, Md 608
Fred. Bredel Co., Milwaukee, Wis. 610
Gas Bench Construction Co., St. Louis, Mo. 608
Parker-Russell Mining and Mfg Co., St. Louis, Mo..... 609

VERTICAL S'S.

Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 609
Fred. Bredel Co., Milwaukee, Wis. 610
Gas Bench Construction Co., St. Louis, Mo. 608
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 609

REGENERATIVE FURNACES.

Baltimore Retort and Firebrick Co., Baltimore, Md..... 608
Bartlett, Hayward & Co., Baltimore, Md. 613
Fred. Bredel Co., Milwaukee, Wis. 610
Gas Bench Construction Co., St. Louis, Mo. 608
J. H Gautier & Co., Jersey City, N. J. 608
Laclede Firebrick Mfg. Co., St. Louis, Mo. 596
Missouri Firebrick Co., St. Louis, Mo. 608
Parker-Russell Mining and Mfg. Co., St Louis, Mo. ... 609

SELF-SEALING MOUTHPIECE DOORS.

Continental Iron Works, Brooklyn, N. Y. 614
Davis & Farnum Mfg Co., Waltham, Mass. 612
Fred. Bredel Co., Milwaukee, Wis. 610
Isbell-Porter Co., Newark, N. J 600
Kerr Murray Mfg. Co., Fort Wayne, Ind. 603
Logan Iron Works, Brooklyn, N. Y. 606
R. D. Wood & Co., Philadelphia, Pa 604
Stacey Mfg. Co., Cincinnati, O 605
The Gas Machinery Co., Cleveland, O. 596
Western Gas Construction Co., Fort Wayne, Ind..... 620

INCANDESCENT GAS LAMPS.

D M. Steward Mfg. Co., Chattanooga, Tenn..... 554
General Gas Light Co., Kalamazoo, Mich..... 603
Geo. G. Ramsdell, New York City 594
Welsbach Company, Gloucester, N. J..... 606

BURNERS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 554
Wm. M. Crane Co., New York City.. 598

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn 554

STREET LAMPS.

Thos. T. W. Miner, New York City..... 604
Welsbach Street Lighting Co., New York and Phila... 606

PURIFIERS.

Connelly Iron Sponge & Governor Co., New York City.. 609
Cruse-Kemper Co., Philadelphia, Pa..... 600
Davis & Farnum Mfg. Co., Waltham, Mass. 612
Fred. Bredel Co., Milwaukee, Wis. 610
Isbell-Porter Co., Newark, N. J 600
Kerr Murray Mfg. Co., Fort Wayne, Ind. 612
R. D. Wood & Co., Philadelphia, Pa. 614
Stacey Mfg. Co., Cincinnati, O.. 615
Western Gas Construction Co., Fort Wayne, Ind. 620

PURIFYING MATERIALS.

Connelly Iron Sponge & Governor Co., New York City.. 609
Greenpoint Chemical Works, Brooklyn, N. Y. 594

VALVES.

Continental Iron Works, Brooklyn, N. Y.. 614
Davis & Farnum Mfg. Co., Waltham, Mass.. 612
Economical Gas Apparatus Construc'n Co, Toronto, Ont 594
Isbell-Porter Co., Newark, N. J. 600
Kerr Murray Mfg. Co., Fort Wayne, Ind. 612
Ludlow Valve Manufacturing Co., Troy, N. Y. 601
R. D. Wood & Co., Philadelphia, Pa. 614
Stacey Mfg. Co., Cincinnati, O. 615
The P. H. & F. M. Roots Co., Connersville, Ind. 603
Western Gas Construction Co., Fort Wayne, Ind. 620

EXHAUSTERS.

Connelly Iron Sponge & Governor Co., New York City.. 609
Connersville Blower Co., Connersville, Ind. 612
Davis & Farnum Mfg. Co., Waltham, Mass. 612
Isbell Porter Company, Newark, N. J. 600
Kerr Murray Mfg. Co., Fort Wayne, Ind. 612
The P. H. & F. M. Roots Co., Connersville, Ind. 603

PURIFIER SCREENS.

John Cabot, Hoboken, N. J 606
Western Gas Construction Co., Fort Wayne, Ind..... 620

GAS STOVES.

American Meter Co., New York and Philadelphia 609
Keystone Meter Co., Royersford, Pa. 608
Maryland Meter & Manufacturing Co., Baltimore, Md.. 608
Nathaniel Tufts Meter Co., Boston, Mass. 608

HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich. 597

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y. 604

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. 613
Continental Iron Works, Brooklyn, N. Y. 614
Cruse-Kemper Co., Philadelphia, Pa. 600
Davis & Farnum Mfg. Co., Waltham, Mass. 612
Deily & Fowler, Philadelphia, Pa. 616
Economical Gas Apparatus Construc'n Co., Toronto, Ont 594
Kerr Murray Mfg. Co., Fort Wayne, Ind. 612
Logan Iron Works, Brooklyn, N. Y. 616
R. D. Wood & Co., Philadelphia, Pa. 614
Riter-Conley Mfg. Co., Pittsburgh, Pa. 615
Stacey Mfg Co., Cincinnati, O. 615
Western Gas Construction Co., Fort Wayne, Ind. 620

STORAGE TANKS.

Davis & Farnum Mfg. Co., Waltham, Mass. 612
Kerr Murray Mfg. Co., Fort Wayne, Ind. 612
Stacey Mfg. Co., Cincinnati, O. 615
Western Gas Construction Co., Fort Wayne, Ind. 620

PAINTS.

American Standard Composition Co., New York City.. 599

PATENTS, TRADE-MARKS, COPYRIGHTS.

Royal E. Burnham, Washington, D. C. 596

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.
IMPROVED AMMONIA CONCENTRATOR.
About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, • Detroit, Mich.

GREENPOINT
O·X·I·D·E
IS RELIABLE.
We quote "delivered" prices.
May we not send you a sample?
Greenpoint Chemical Works, Brooklyn, N. Y.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,
Consulting Engineers.
Builders of UP-TO-DATE Machinery and Appliances for Coal and Water Gas Plants. :: :: :: :: ::
PLANS, SPECIFICATIONS AND ESTIMATES PREPARED.
AMERICAN OFFICE:
269 Front St., East, Toronto, Canada.

ARTHUR E. BOARDMAN, C.E.,
For several years associated with the late
CAPTAIN WILLIAM HENRY WHITE,
WILL CONTINUE THE BUSINESS OF
CONSULTING ENGINEER
For Gas, Water and Electric Light Companies, at
No. 41 Wall Street, Room 1707, New York.
TELEPHONE, 5534 BROAD.

RAMSDELL INVERTED GAS LAMP No. 4.
OUR NEW MEDIUM PRICED INVERTED LAMP.
A LAMP THAT WILL NOT CARBONIZE.
THE BEST LAMP EVER OFFERED FOR THE PRICE.
A LAMP THE GAS COMPANIES AND UP-TO-DATE DEALERS ARE SELLING IN LARGE QUANTITIES.
AN ARTICLE THAT SELLS AT SIGHT.
Consumes 2½ to 3 cubic feet per hour, gives 65 candles of light.
Sold Complete with Globe, Mantle and Adaptor Neatly Boxed.
ASK ABOUT IT.
RAMSDELL INVERTED GAS LAMP CO.,
530 BROADWAY, NEW YORK CITY.

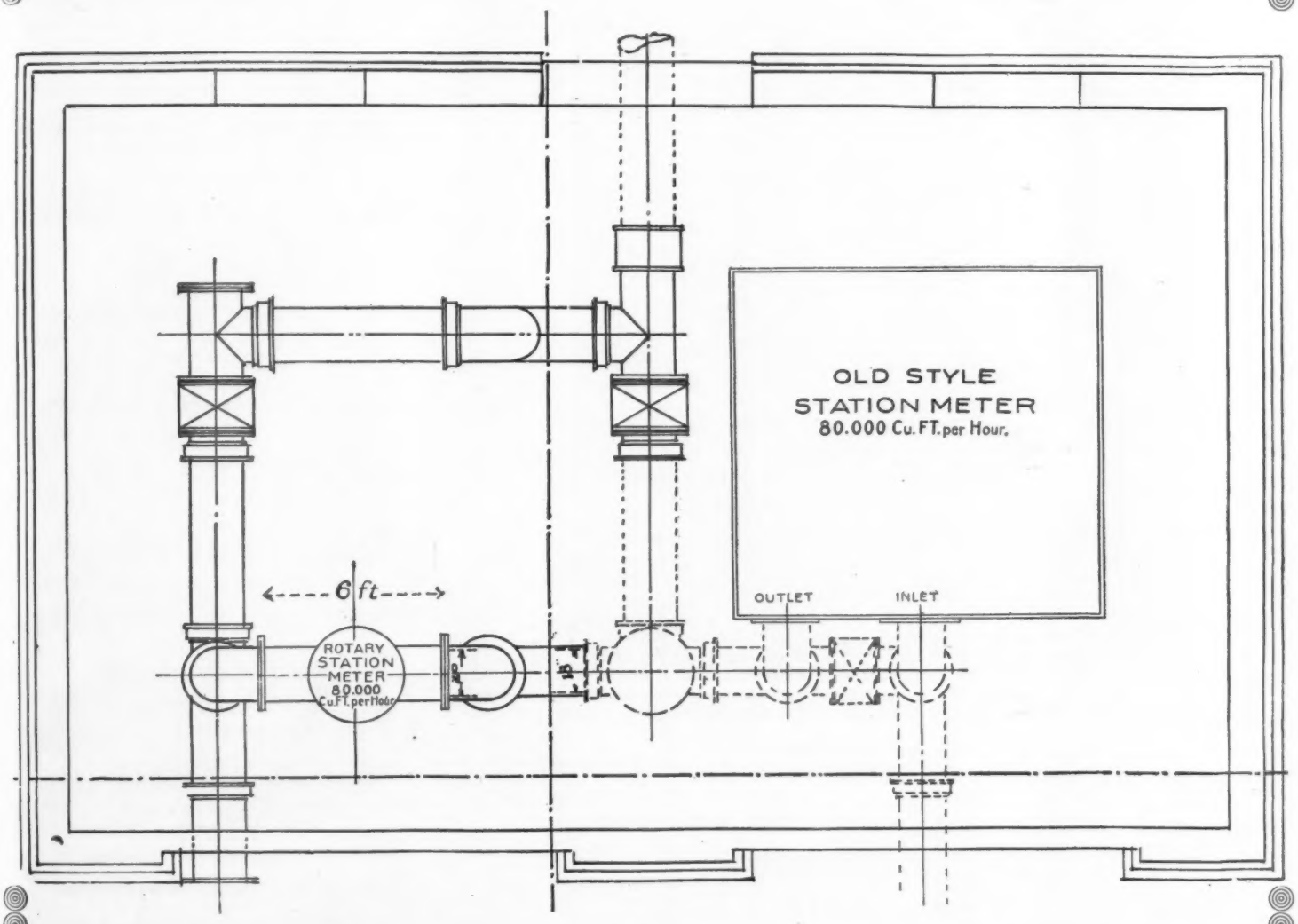
COAL TAR AND AMMONIA,
By GEORGE LUNGE, PH.D. Third and Enlarged Edition.
Price, $15 For Sale by
A. M. CALLENDER & CO., 42 Pine St., New York City.

OFFICERS:

E. C. BROWN, President.
B. H. SPANGENBERG, Gen'l Mgr. and Eng'r.
L. J. MONTGOMERY, Sec'y and Treas.
SIDNEY A. REEVE, M.E., Consulting Eng'r.

DIRECTORS:

E. C. BROWN, GEO. D. ROPER,
IRA C. COPLEY, Dr. F. SCHNIEWIND,
HENRY L. DOHERTY, THOMAS G. MARSH, M.E.,
FREDERICK H. SHELTON.



PLAN OF THE ARRANGEMENT OF THE ROTARY METER AT THE WORKS OF THE CROYDON COMMERCIAL GAS AND COKE COMPANY, CROYDON, ENGLAND.

The Rotary Meter herein shown was set in the fall of 1904. The Croydon Company has recently placed an order with the English Rotary Meter Company for a Rotary Meter having a capacity of 180,000 cubic feet per hour.

The Picture Tells the Story.

One-half the Cost—One-tenth the Space.

When in Need of Station Meters

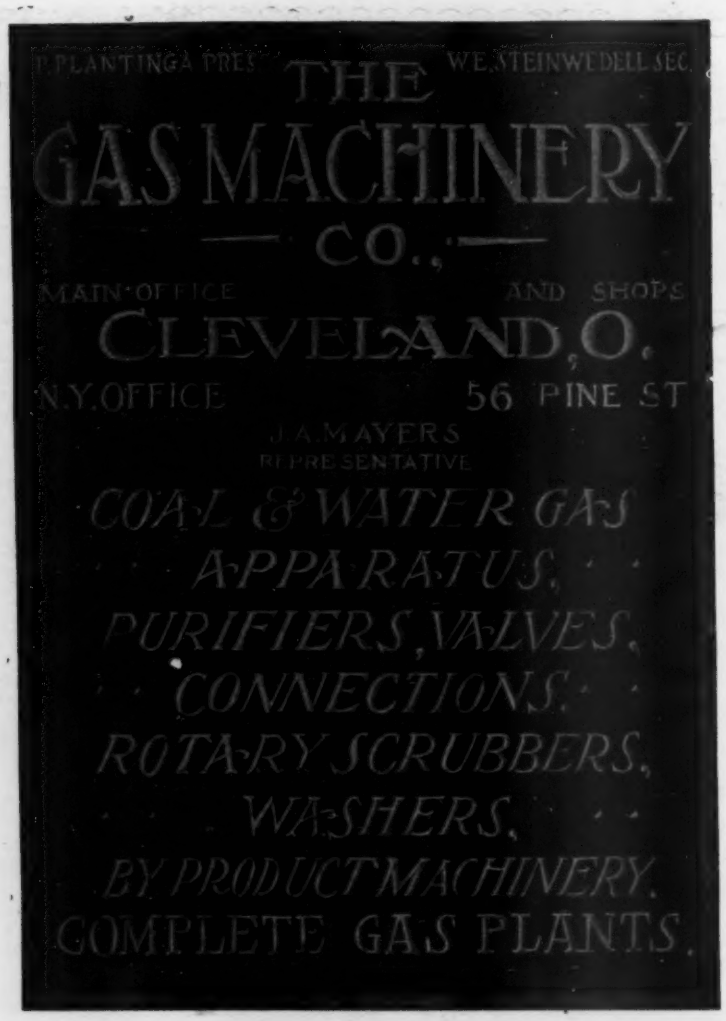
write

ROTARY METER COMPANY,

280 Broadway,

NEW YORK.

Send for Catalogue.



PRACTICAL PHOTOMETRY,

By WILLIAM JOSEPH DIBDIN,

PRICE, $3. FOR SALE BY

A. M. CALLENDER & CO., 42 Pine Street, New York City.

PATENTS, TRADE MARKS, COPYRIGHTS.

ROYAL E. BURNHAM,

Solicitor of Patents and Counsellor in Patent Causes.

833 Bond Building, Washington, D. C.

Send for Pamphlet on Patents.

Bristol's Recording Pressure Gauges

(ALL RANGES).

Used the World Over.

Necessary Equipment

Write for Catalogue A.

For Every Gas Plant.

New York: 114 Liberty St.

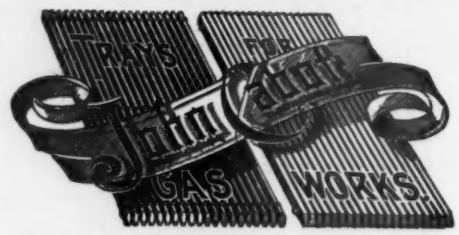
London: 23 College Hill

The Bristol Co., Waterbury, Conn., U S.A.

Church's Patent Trays.

Reversible; Strongest; Most Easily Repaired.

Special Trays for Iron Sponge.



1412-1416 Adams Street, Hoboken, N. J.

We also Supply the Cheapest and Strongest

•Reversible Bolted Trays•

IN THE MARKET.

SEND FOR BOOKLET AND CIRCULARS.

THE BEST are THE CHEAPEST.

Laclede RETORTS, Laclede

GAS BENCHES, LACLEDE FIREBRICK,

LININGS FOR WATER GAS SETS A SPECIALTY.

AWARDED THE ONLY **GRAND PRIZES** AT ST. LOUIS EXPOSITION,

By a Jury Composed of the Most Competent Gas Engineers of Four Continents.

Designs and Estimates Cheerfully Furnished.

LACLEDE FIRE BRICK MFG. CO.,

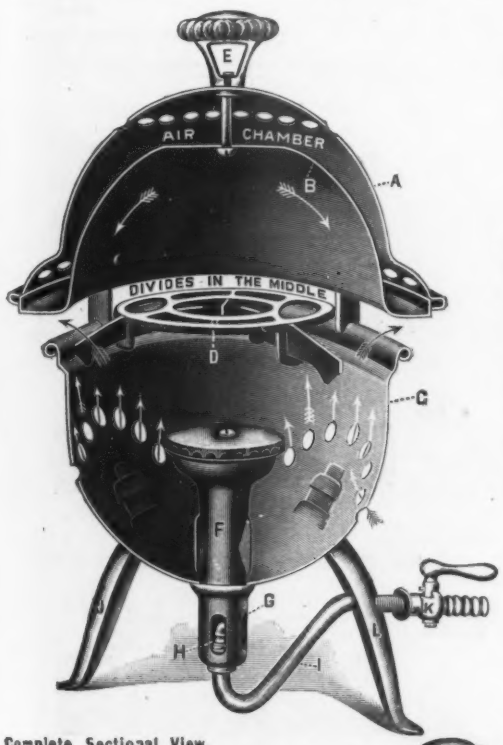
SAINT LOUIS. MO.

ORDERS
FOR
Humphrey Ovals

For either immediate or future delivery should be placed now. Height, 16 inches. Weight each, 4½ lbs Price, polished nickel, per dozen, $24. Not sold in less than dozen lots. Shall we quote you discounts?

THE FINEST COMBINED GAS HEATERS AND GAS HOT PLATE IN THE WORLD. THOROUGHLY PRACTICAL.

HANDSOME——EFFICIENT——DURABLE.



Complete Sectional View.

HEAT with the whole of it.

Beautifully nickel-plated. Costs no more than a black one. Has adjustable air mixer. . .

Sample will be sent to any Gas Company, express prepaid, upon receipt of $2. . . . . .

No Nuts, Bolts or Screws.

COOK with the half of it.

OPERATION.

The coldest air lies next to the floor always. The Humphrey Oval (see illustration) takes the cold air from the floor, heats it hot, and forces it out at the side. Other stoves allow this heat to rise directly to the ceiling without being diffused through the room, thus taking a long time to heat the room, wasting time and fuel.

When not in use, or to pack, pull the legs out, untwist the burner and pull it out, tuck one-half of the jacket inside the other and lay the legs and burner in the bowl. A child can do it, and, when done, it occupies a very small space.

We also have the finest and most complete line of Gas Water Heaters in the Market. Shall we send catalogue and prices?

HUMPHREY CO.,
KALAMAZOO, MICH., U. S. A.

MUELLER GAS COCKS.

LOCK-WING METER COCK.

C—1175.

Taking a meter cock apart and cleaning it is one way to make sure it won't clog the meter with grease. You don't have to do this with Mueller Cocks, because when they are put up all grease that won't stick to the ground surfaces is wiped off.

THE MARK OF DECATUR H⊙M ILL. U.S.A. MUELLER GOODS
UNCONDITIONAL GUARANTEE

H. MUELLER MFG. CO.,

Decatur, Ill., U. S. A. New York, N. Y., U. S. A.

BINDER
FOR THE
JOURNAL.

PRICE, $1.

FOR SALE BY

A. M. CALLENDER & CO., - 42 Pine St., New York.

Bray's Union-Jet.

NOTHING SUCCEEDS LIKE SUCCESS.

BRAY BURNERS

Are made by a company that makes **more open flame** burners than **any other concern in the world.**

The makers of the **BRAY only make burners, and, knowing how, they make the best.**

When you buy **BRAY BURNERS** you buy **durability, efficiency** and **satisfaction,** both for **yourself** and your **consumer.**

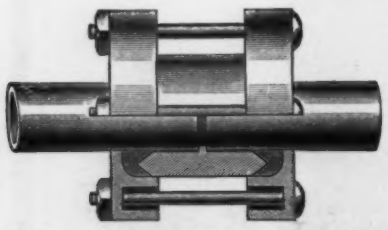
There is **40 years of experience** back of every Bray Burner.

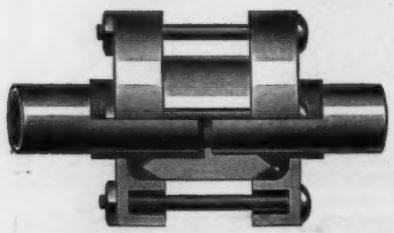
W. M. CRANE COMPANY,

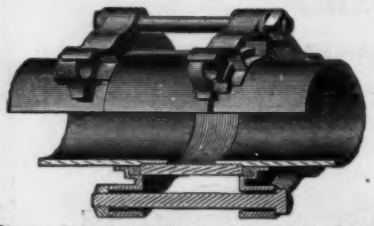
1131-33 Broadway, New York, N. Y.,

WE MAKE GAS APPLIANCES OF ALL KINDS. Sole Agents for Bray Burners in the U. S. and Canada.

Self-Lighting Burner.


Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.


Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe,


Clamp, Style 4, for Repairing Leaks on Screw Collar.

Long Sleeve, Style 2, for Mending Broken Lines.

S. R. DRESSER MANUFACTURING CO.,

SUCCESSORS TO

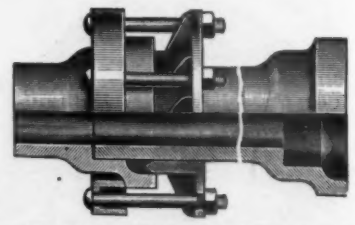
S. R. DRESSER,

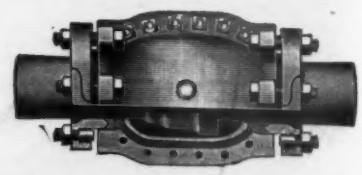
BRADFORD, PA., U. S. A.,

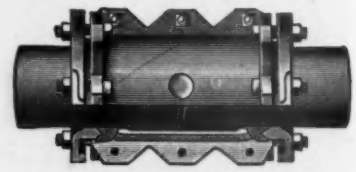
Patentee and Manufacturer of Specialties for Gas and Water Lines,

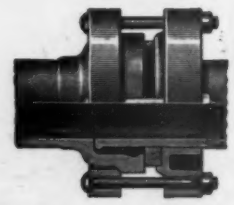
Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.

STATE REQUIREMENTS AND SEND FOR CATALOGUE.


Coupling, Style 9, for Special Style Cast Iron Pipe.


Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.


Clamp, Style 4½, for Repairing Leaky Lead or Cement Joints in Cast Iron Pipe.

MAIN AND SERVICE LAYING.

Gas and water companies about to lay new mains or services will find it useful to communicate with us. Our gangs are experienced and our plant is completely equipped for street main and service laying in all branches. These are our specialties. We are in a position to quote prices which will attract the attention of the economical manager.

Gas Company References. Correspondence Solicited.

Telephone, 302 Flushing. SULLIVAN BROS., Flushing, N. Y.

ELECTRIC GAS LIGHTING.

How to install electric gas igniting apparatus, including the jump spark and multiple systems for use in houses, churches, theaters, halls, schools, stores or any large building. Also, the care and selection of suitable batteries, wiring and repairs.

By H. S. NORRIE.

Price, 50 cents. Orders may be sent to

A. M. CALLENDER & CO., 42 PINE ST., N. Y CITY.

PRACTICAL HANDBOOK ON GAS ENGINES, WITH INSTRUCTIONS FOR CARE AND WORKING OF THE SAME,

By G. LIECKFELD, C.E. Translated with Permission of the Author, by GEO. M. RICHMOND, M.E. Price, $1.00.

A. M. CALLENDER & CO., 42 PINE ST., NEW YORK CITY.

H. M. Byllesby & Company

(Incorporated),

GAS ENGINEERS,

DESIGN, CONSTRUCT AND OPERATE COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

HIGH AND LOW PRESSURE DISTRIBUTING SYSTEMS.

AMERICAN TRUST BUILDING,

CHICAGO.

THE AMERICAN STANDARD COMPOSITION CO.

—) MANUFACTURES (—

HEAT PROOF AND DAMP PROOF PAINTS

For Structural Iron and Steel, Gas Apparatus, Underground Piping, Boiler Fronts, Stacks, etc.

Our Paints will not crack, peel or scale. Heat does not affect them. They are moisture proof.

They are the Paints that Don't Come Off!

We let you Try before you Buy. Send for samples and prices.

AMERICAN STANDARD COMPOSITION COMPANY,

1707, Wall Street Exchange Building, New York.

Modern Machine Shop Construction, Equipment and Management,

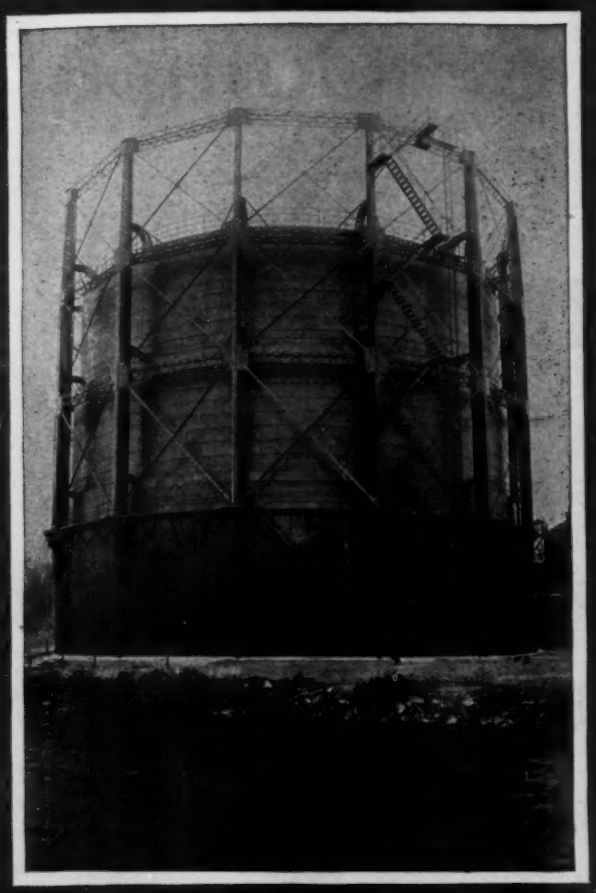
By OSCAR E. PERRIGO, M.E.,

Member American Society of Mechanical Engineers. Expert in Machine Shop and Factory Organization, Modern Shop Methods, Time and Cost Systems, etc.

Nearly 400 Large Quarto Pages, Illustrated by over 200 Engravings Specially Made by the Author. A work designed for the practical and everyday use of the Architect who designs, the Manufacturers who build, the Engineers who plan and equip, the Superintendents who organize and direct, and for the information of every Stockholder, Director, Officer, Accountant, Clerk, Superintendent, Foreman and Workman of the Modern Machine Shop and Manufacturing Plant of Industrial America.

PRICE, $5. For Sale by

A. M. CALLENDER & CO., - - - - - 42 Pine Street, New York City.



ARTHUR R. CRUSE
President

A. E. KEMPER
Treasurer

HENRY W. SCATTERGOOD
Vice-President

FRANK FLAVELL
Secretary

CRUSE-KEMPER COMPANY

PHILADELPHIA OFFICES
1205-6 Stephen Girard Building

WORKS
Ambler, Pa

Manufacturers of

TRIPLE
DOUBLE and
SINGLE-LIFT

Gas Holders

WITH OR WITHOUT
METAL TANKS

Oil and Water Tanks
Purifier Covers
General Plate Metal Work and
Steel Water Towers

PLANS, SPECIFICATIONS AND ESTIMATES
PROMPTLY FURNISHED ON REQUEST

J. S. DeHART, JR.,
PRESIDENT

A. F. WEHNER,
SECRETARY

R. K. WEHNER,
TREASURER

ISBELL-PORTER COMPANY

GAS ENGINEERS & BUILDERS OF GAS WORKS

BENCH WORK

CHARGING AND
DISCHARGING
MACHINERY

MACKENZIE
EXHAUSTERS

PRIMARY AND
SECONDARY
CONDENSERS
FOR FRESH
OR SALT WATER

ISBELL VALVES
SPECIALS

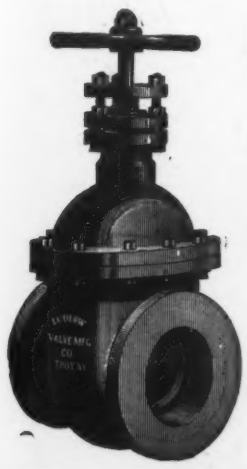
TAR
EXTRACTORS

P. & A. TAR EXTRACTORS
FOR WATER GAS

ROTARY AMMONIA
SCRUBBERS

SHAVING
SCRUBBERS
PURIFIERS
STREET GOVERNORS

MAIN OFFICE AND WORKS
BRIDGE & OGDEN STREETS
NEWARK, N. J.
ESTABLISHED 1865



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

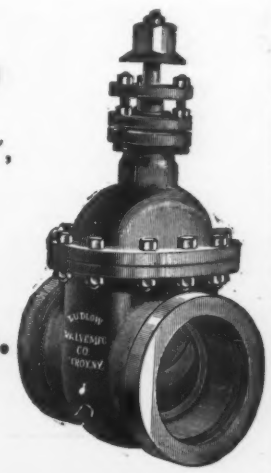
Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.



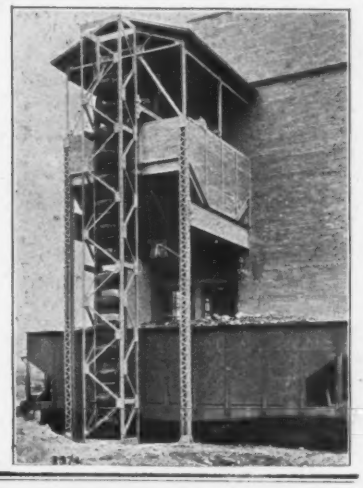
The Dodge Conveyor

reduces cost of handling to a minimum whilst insuring the maximum of efficient, speedy service. It avoids accumulation of spilled material.

Write for details.

LINK-BELT COMPANY,

Philadelphia. NEW YORK: 299 Broadway. **Chicago.** PITTSBURGH: 1501 Park Bldg. **Indianapolis.** ST. LOUIS: Missouri Trust Bldg.



J. F. W. JOST,

CHEMICAL ENGINEER

—IN—

GAS MANUFACTURE,

P. O. BOX 2043, PHILADELPHIA, PA.

"INDUSTRIAL" RAILWAY AND CHARGING CARS

For Handling Coal in and around Gas Works.
Saves 50 per cent. in labor.
Examine our system. Described in Catalogue 68.
C. W. HUNT COMPANY, West New Brighton, N. Y.

The Gas Engineer's Laboratory Handbook,

BY JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 42 Pine St., N. Y. City.

THE

Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

Second Edition. Price $2. For Sale by

A. M. CALLENDER & CO.,
42 Pine Street, N. Y. City.

Cox's High Pressure Fluid Discharge Computer.

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,

p_1 = absolute initial pressure in pounds per square inch,

p_2 = absolute terminal pressure in pounds per square inch,

L = length of pipe in miles,

w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

(4.) Opposite any desired discharge will also be found the required diameter of pipe.

Price of the Computers, in Cloth Case, 6½ x 8 inches, $5 Each, Net.

For Sale by

A. M. CALLENDER & CO., 42 Pine Street, New York City.

The "Gas World" Analyses of Accounts of Gas Undertakings,

1904-1905,

Showing at a glance the Accounts of 113 Coal and Water Gas Companies, Itemized under

Coal Carbonized, Gas Made and Sold, Yield of Residuals, Public Lamps, Mileage of Mains, Consumers, Price of Gas, Illuminating Power, Financial Results, Revenue.

Manufacturing Charges, Rates and Taxes, Distribution Charges, Management Charges, Bad Debts, Capital Paid Up, Capital per Ton and per Thousand, Reserve Funds, etc.

EVERY GAS ENGINEER AND MANAGER SHOULD HAVE A COPY OF THIS INVALUABLE AND UP-TO-DATE WORK

Price, $3. For Sale by

A. M. CALLENDER & CO., 42 PINE ST., NEW YORK CITY.

LLOYD'S SUBMERSION WASHERS.

Maximum Efficiency,
Minimum Back Pressure,
Complete Safety.

Western Sales Agent
BARTLETT, HAYWARD & CO., Baltimore, Md.

LLOYD CONSTRUCTION CO., Detroit, Mich.

WHY DO GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS BUILT BY

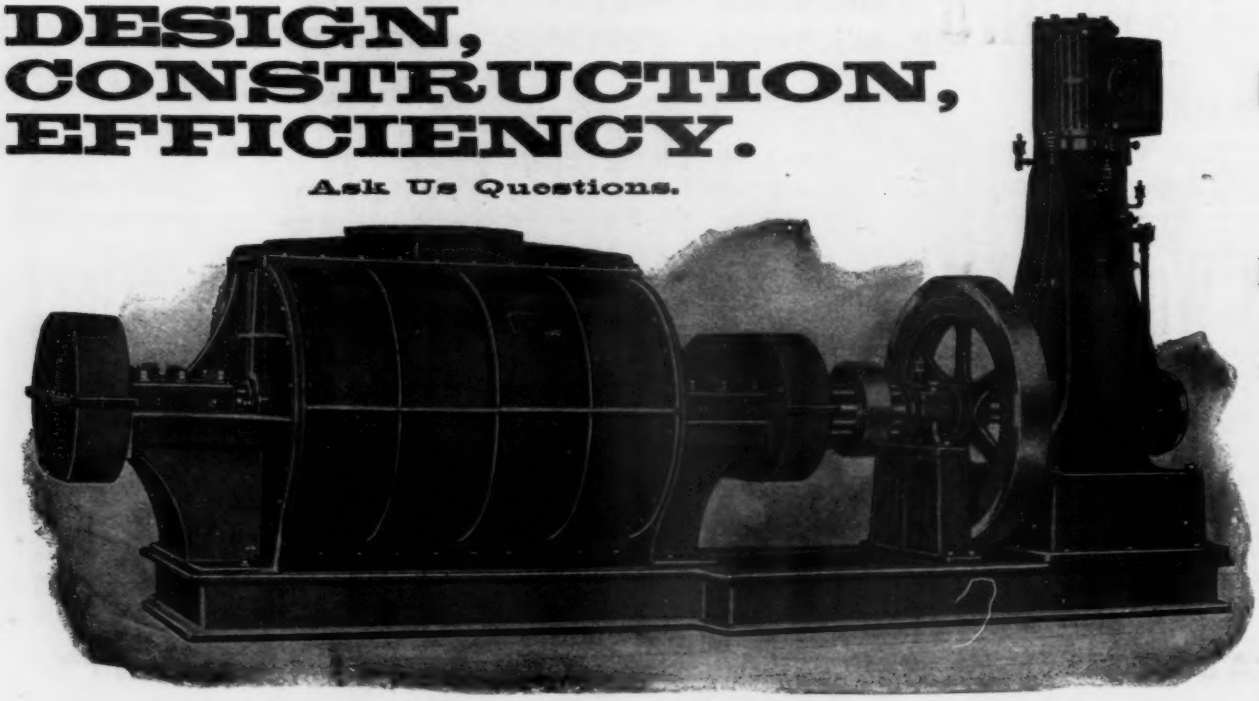
THE CONNERSVILLE BLOWER CO.

Stand so High in the estimation of those using them?

THE ANSWER IS IN THREE WORDS:

DESIGN, CONSTRUCTION, EFFICIENCY.

Ask Us Questions.



Home Office:
CONNERSVILLE, IND.

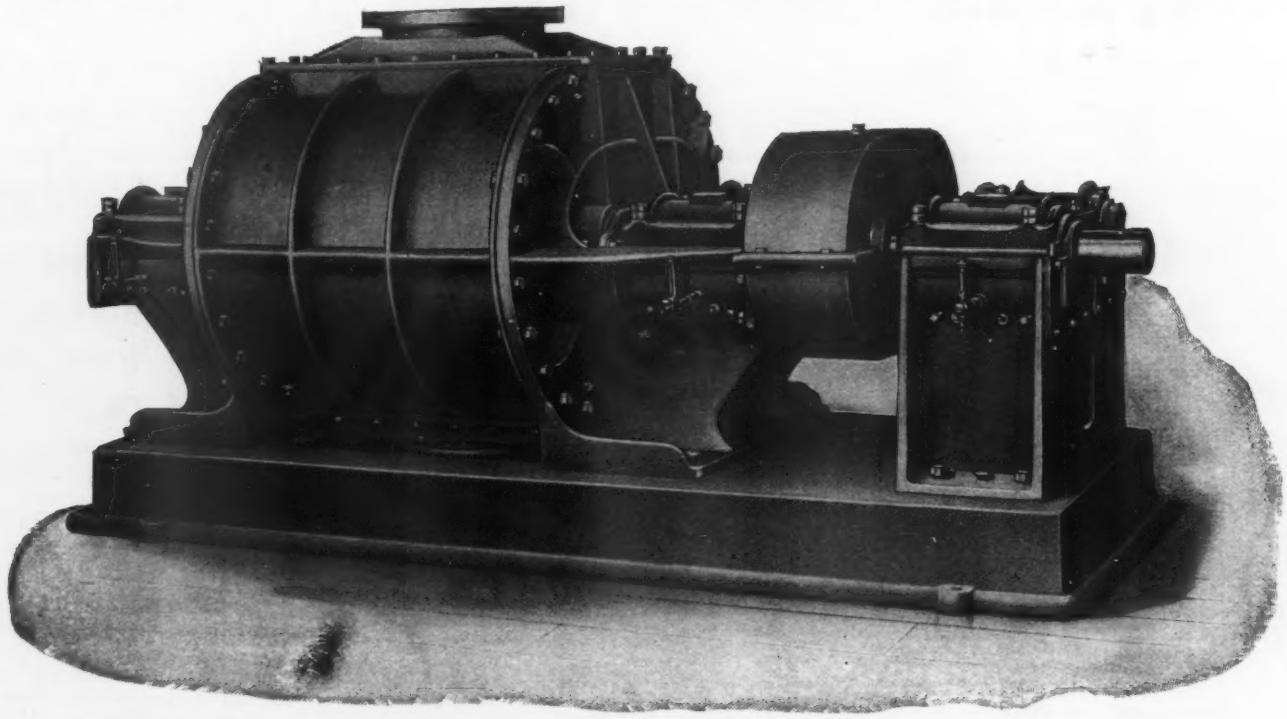
Eastern Sales Agent:
HORACE G. COOKE,
95 Liberty Street,
New York City.

Write us about our Improved Stuffing Boxes.

Something Entirely New.

ROOTS' EXHAUSTERS for HIGH and LOW PRESSURE WORK.

The highest efficiencies obtained. Most perfect devices for adjustment and maintenance of proper alignment. Use our flexible coupling to correct troubles caused by misalignment and engine shaft thrust. Our gas governor is the best. By-pass, gas valves and fittings.



P. H. & F. M. ROOTS COMPANY,

HOME OFFICE: Connersville, Ind. NEW YORK OFFICE: 120-122 Liberty St. CHICAGO OFFICE: 1547 Marquette Bldg.

In the

NEW ZEALAND INTERNATIONAL EXHIBITION,

To be Held During our Coming Winter at Christchurch,

Humphrey Gas Arc Lamps

Will Supply the Greater Share of

INTERIOR ILLUMINATION.

This is in the face of severe electrical competition, but the tender of the Christchurch Gas, Coal and Coke Co., Ltd., has been recognized as embodying the best features of high-class illumination as fully demonstrated in the commercial lighting of Christchurch.

NEW YORK:
46 West Broadway.
SAN FRANCISCO:
519 Eddy Street.

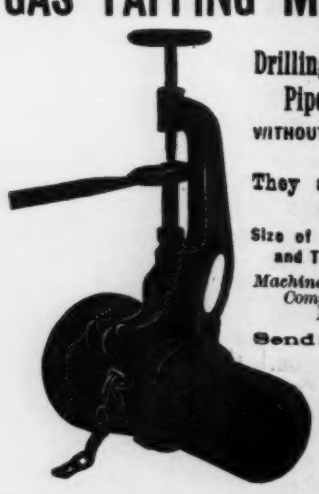
GENERAL GAS LIGHT CO.,
KALAMAZOO, MICH.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.
DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF
CAST IRON PIPE AND SPECIAL CASTINGS
FOR WATER AND GAS.
Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES
—FOR—
Drilling and Tapping Pipe under Pressure
WITHOUT ANY ESCAPE OF GAS.
They are Strong and Compact.
Size of Combination Drills and Taps ¾ to 4-inch.
Machines Sent to any Gas Company for Thirty Days' Trial.
Send for Circulars.

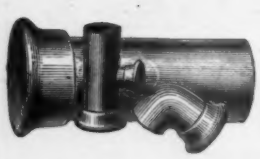


Geo. Light,
DAYTON, O.

"THE MINER"
Globe
Street and Boulevard
Lamps.
Cheapest and Best
THOUSANDS IN USE WITH INCANDESCENT BURNERS.
Send for Catalogues.
THOMAS T. W. MINER,
821-823 Eagle Av., N.Y.

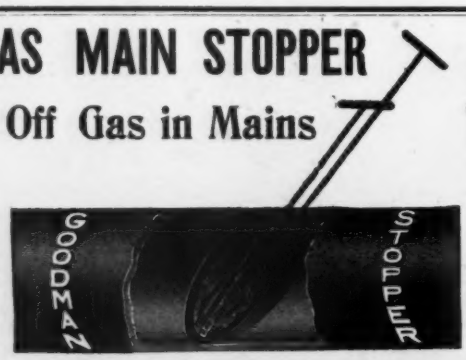
GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.
Plans prepared and Estimates furnished at short notice.
J. P. WHITTIER,
238 Java Street, Brooklyn, N. Y.

WARREN FOUNDRY AND MACHINE CO.,
Established 1856. Works at Phillipsburgh, N. J.
New York Office, 170 Broadway.



CAST IRON WATER AND GAS PIPE,
FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

SAFETY GAS MAIN STOPPER COMPANY,
For Shutting Off Gas in Mains
Any size gas main can be shut off in 30 seconds. : : :
Temporarily during alterations and repairs. : : : :
STOPPERS SENT ON TRIAL.



Address: SAFETY GAS MAIN STOPPER CO., 552 E. 135th St., New York City.

Coke and ashes are handled in ton and ton-and-a-half quantities at 1,000 feet a minute.

TELPHERAGE FOR GAS WORKS.
Our Telpherage System is a boon to gas works, because coal, coke, ashes - any material in any condition—can be handled at great speed, and with unapproachable economy because one machine and one operator do the work. The picture shows part of the plant we recently installed for the Lowell Gas Light Co., Lowell, Mass.
State your case—and ask for booklet 53.
UNITED TELPHERAGE DEPARTMENT
The Dodge Coal Storage Co.
Philadelphia—Hunting Park Ave. and Reading Ry.
New York—299 Broadway.
Chicago—39th Street and Stewart Avenue.
Pittsburgh—1501-2 Park Building.
Portland, Ore.—309 McKay Building.

Chollar's System of Gas Purification.
THE PURIFIED GAS REVIVES THE FOULED OXIDE.

FIELD'S ANALYSIS
For the Year 1905.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 37th Year of Publication.

COMPILED AND ARRANGED BY **JOHN W. FIELD,**
Secretary and General Manager of The Gas Light and Coke Company, London.

PRICE, $5. FOR SALE BY
A. M. CALLENDER & CO., 42 PINE ST., NEW YORK CITY.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

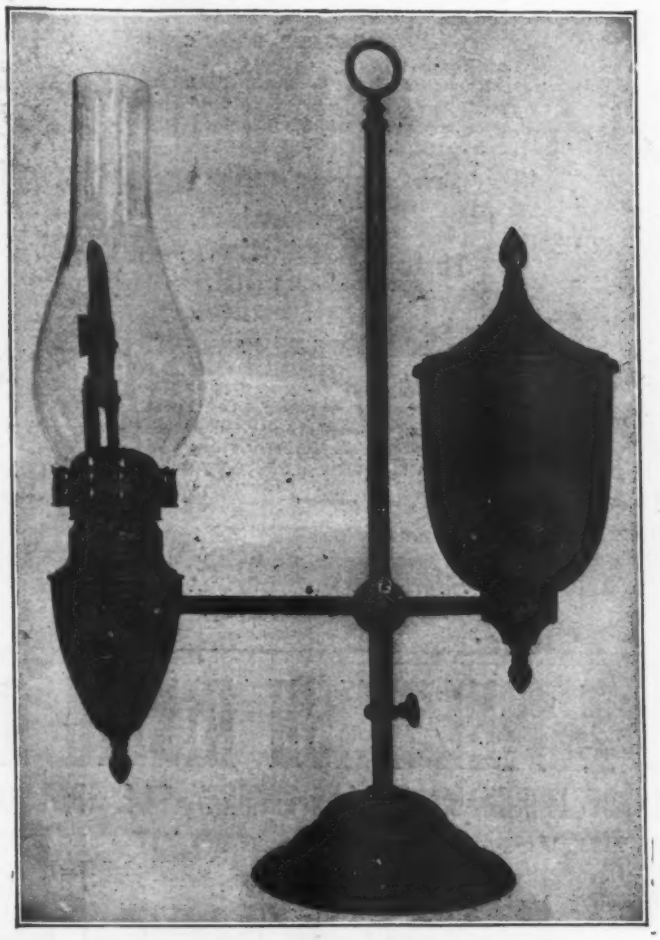
OCTOBER, 1906.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Mon.	1	No L.	No L.
Tue.	2	No L. FM	No L.
Wed.	3	No L.	No L.
Thu.	4	6.10 PM	8.10 PM
Fri.	5	6.10	8.40
Sat.	6	6.10	9.10
Sun.	7	6.00	9.50
Mon.	8	6.00	10.30
Tue.	9	6.00	11.20
Wed.	10	6.00 LQ	12.10 AM
Thu.	11	6.00	1.00
Fri.	12	6.00	2.00
Sat.	13	6.00	3.10
Sun	14	5.50	5.10
Mon.	15	5.50	5.10
Tue.	16	5.50	5.10
Wed.	17	5.50 NM	5.10
Thu.	18	5.50	5.10
Fri.	19	5.50	5.10
Sat.	20	5.50	5.10
Sun.	21	5.40	5.20
Mon.	22	8.20	5.20
Tue.	23	9.20	5.20
Wed.	24	10.30 FQ	5.20
Thu.	25	11.30	5.20
Fri.	26	12.40 AM	5.20
Sat.	27	1.40	5.20
Sun.	28	2.40	5.30
Mon.	29	3.40	5.30
Tue.	30	No L.	No L.
Wed.	31	No L. FM	No L.

TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50



THE ELLIOTT KEROSENE STANDARD PHOTOMETER LAMP.

****

10-Candle Power.

****

This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

1st. It uses Standard Kerosene Oil (Pratt's Astral Oil or equivalent).

2d. It is remarkably steady. Will burn 24 hours continuously with less than 2 per cent. variation.

3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

OCTOBER, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
		P. M.	A.M.
Mon.	1	5.30	5.00
Tue.	2	5.30	5.00
Wed.	3	5.30	5.00
Thu.	4	5.30	5.00
Fri.	5	5.30	5.00
Sat.	6	5.30	5.00
Sun.	7	5.30	5.00
Mon.	8	5.20	5.10
Tue.	9	5.20	5.10
Wed.	10	5.20	5.10
Thu.	11	5.20	5.10
Fri.	12	5.20	5.10
Sat.	13	5.20	5.10
Sun.	14	5.20	5.10
Mon.	15	5.10	5.20
Tue.	16	5.10	5.20
Wed.	17	5.10	5.20
Thu.	18	5.10	5.20
Fri.	19	5.10	5.20
Sat.	20	5.10	5.20
Sun.	21	5.10	5.20
Mon.	22	5.00	5.30
Tue.	23	5.00	5.30
Wed.	24	5.00	5.30
Thu.	25	5.00	5.30
Fri.	26	5.00	5.30
Sat.	27	5.00	5.30
Sun.	28	5.00	5.30
Mon.	29	4.45	5.35
Tue.	30	4.45	5.35
Wed.	31	4.45	5.35

TOTAL HOURS DURING 1906.

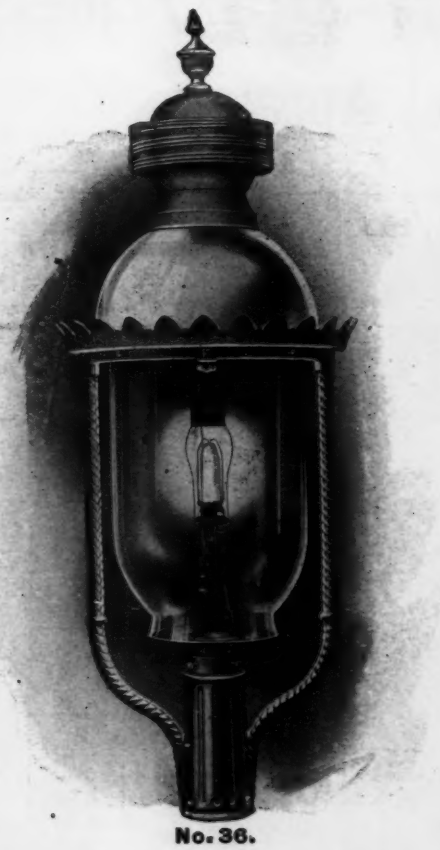
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....



No. 36.

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

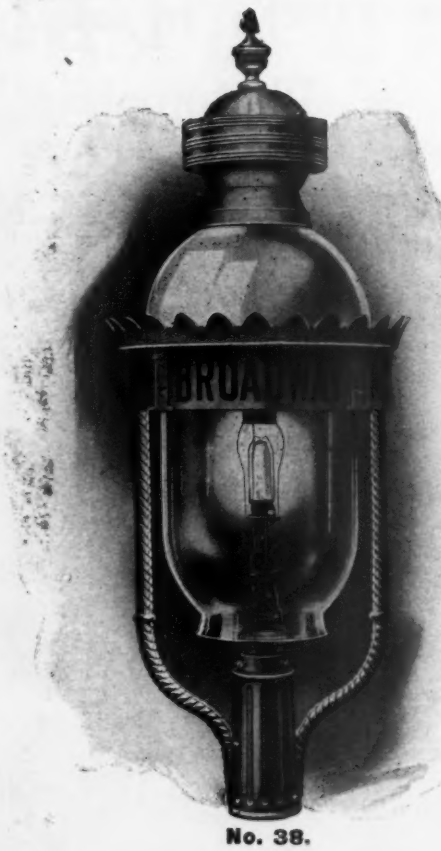
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.



No. 38.

THE NEW NO. 7 WELSBACH DINING ROOM FIXTURE.

PRICE, EACH, COMPLETE, WITH SHADE, FRINGE, MANTLE AND CHIMNEY, $14. PER DOZ., $150. DISCOUNT, 50 PER CT.

Standard Length, 30 inches.
The New No. 7 Welsbach Dining Room Fixture, when ordered, will be sent complete, as follows:

- 1 No. 7 Harp Fixture and Brass Crown finished in Brushed Brass.
- 1 No. 66 Welsbach Burner (high candle power).
- 1 No. 4 Pilot By-pass.
- 1 No. 4197 Mantle — Intensive Brand.
- 1 No. 306 Chimney (air hole).
- 1 Fourteen-inch GREEN Art Glass Shade, with six-inch Green Beaded Fringe.

VARIATIONS.

Finished in oxidized copper, oxidized brass, etc., 25 cents extra.

Shades in Ruby and Green--Ruby, Amber and other colors, without extra charge.

Special colors require a few days extra time to fill orders.

Green Shades will be shipped unless otherwise ordered.

This fixture is being largely used by Gas Companies as a dining room fixture at the popular retail price of $10 complete, and is a great favorite for moderate sized two and three-story residences. In popularity and price it is unequalled.

WELSBACH CO.,
Salesrooms in All the Principal Cities of the United States.
Factories:
GLOUCESTER, N. J.
CHICAGO, ILL.

THE UNITED GAS IMPROVEMENT COMPANY

For the Six Months Ending July 1st, 1906, has been Awarded Contracts for 25 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

New Britain, Conn. (2d contract).	**Philadelphia, Pa.**	**Lewiston, Pa.**
Malden, Mass. (3d contract).	**Waterbury, Conn.**	**Greenville, Tex.**
Kirksville, Mo.	**Manchester, N. H.**	**New York,** Cent. Un. (3d contract).
St. Johnsbury, Vt.	**Allentown, Pa.**	**Jefferson City, Mo.**
Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

TOTAL SETS TO JULY 1, 1906, - - - - - 618

TOTAL DAILY CAPACITY TO JULY 1, 1906, 488,930,000 CUBIC FEET.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
88 VAN DYKE ST., BROOKLYN, N. Y.
MANUFACTURERS OF
CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

L. C. HAMLINE, President and General Manager. AUGUST COURT, Secretary and Treasurer.

GAS BENCH CONSTRUCTION CO.,

SUCCESSORS TO
ST. LOUIS GAS CONSTRUCTION CO.,
DESIGNERS AND BUILDERS OF

COAL GAS BENCHES,

SPECIAL HIGH GRADE REFRACTORY MATERIAL FOR BENCH SETTINGS, WATER GAS LININGS, ETC.
ST. LOUIS, MO.

COAL TAR
— AND —
AMMONIA.

Third and Enlarged Edition.

BY
GEORGE LUNGE, Ph.D.

Price, $15. For Sale by
A. M. CALLENDER & CO.,
42 Pine Street, New York City.

Practical Photometry,
By William Joseph Dibdin.
Price, ... $3.00.
FOR SALE BY
A. M. CALLENDER & CO.,
42 Pine St., New York City.

Gas Engineer's Pocket-book, — BY — HENRY O'CONNOR,
Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works. PRICE, $3.50. For Sale by
A. M. CALLENDER & CO., 42 Pine St., N.Y. City.

ISAAC C. BAXTER, President.
Works.
LOCKPORT STATION, PA.

ESTABLISHED 1864.

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON.

PETER YOUNG, Secretary and Treas.
Address all communications to
JAMES GARDNER, JR., CO., Room 202 Lewis Bldg.
PITTSBURGH, PA.

Fire Clay Goods for Gas Works.

ESTABLISHED 1868.
L. N. RANCKE, Vice-Pres. & Mgr. F. SCHIAFFINO, Sec'y & Treas.

BALTIMORE RETORT & FIREBRICK CO.
BALTIMORE, MD.,
Manufacturers of all Material for the Construction of Coal Gas Benches.

HALF AND FULL DEPTH AND FREE FIRING BENCHES,
All styles of which we have in operation, equipped with the BEST of LATEST IMPROVEMENTS, proving our claim for SUPERIOR QUALITY and EFFICIENCY.

INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

WALDO BROS., 102 MILK ST., BOSTON, MASS.,
Agents for New England States.

LARGE FACILITIES—Correspondence Solicited.
RAIL and WATER CONNECTIONS to ALL POINTS.

NATIONAL PYROGRANIT COMPANY,
MANUFACTURERS OF
Fire Brick, Tiles, Special Shapes, etc.

NEW YORK OFFICE:
17 Battery Place, New York.

WORKS:
South River, N. J.

ESTABLISHED 1856.
HENRY MAURER & SON
Manufacturers of
High Grade Firebrick, Blocks, Tiles, ETC.,
Works: Maurer, N. J. Office: 420 E. 23d St., N. Y. City.

GEROULD'S IMPROVED RETORT CEMENT.
A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.
Price List, f.o.b. PITTSBURGH, PA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "
C. L. GEROULD,
1200 Bank for Savings Bldg., Pittsburgh, Pa.

FIELD'S ANALYSIS FOR THE YEAR 1905.
An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 37th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by
A. M. CALLENDER & CO., 42 Pine St., New York City.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

— MANUFACTURERS OF —

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the Exclusive Agents *for the* Mitchell Patent Benches, *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* Rear Clinkering. The Mitchell *is the* Original Coal Firing Bench. *We also Erect Plain Benches with* One *to* Six Retorts.

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office: *411 Olive Street, Continental Bank,* ST. LOUIS, MO.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada, Detroit, Seattle, Rochester and St. Louis.

Four-Scoop and Four-Rake Charging and Discharging Machines are operating in Detroit, Mich., and Cincinnati, Ohio. These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

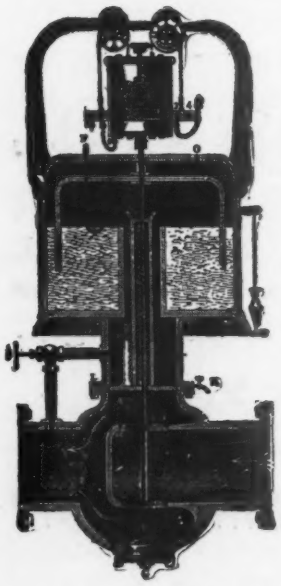
Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins. Coke Screening and Measuring Plants a Specialty.

G. A. BRONDER,
Contracting Engineer and Builder,
229 BROADWAY, NEW YORK.

CONNELLY IRON SPONGE AND GOVERNOR CO.,



Design, Construction and Extension of

COAL OR WATER GAS PLANTS,

Automatic, Balance, High Pressure and Service Governors,

Roots Improved Gas Exhausters,

Iron Sponge, Purifying Material for Gas Purification, Jones Jet Photometers, Pressure Registers, etc.,

INSTALLATION OF SMOKELESS TAR BURNING SYSTEM.

Reinforced Concrete Construction for all Purposes,

Wide Experience in High Pressure Installation and Extension.

GAS SPECIALTIES.

395 Broadway, New York. — 295 West 22d Street, CHICAGO, ILLS.

PARKER-RUSSELL MINING AND MFG. CO.,

OF ST. LOUIS, MO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

ST. LOUIS OFFICE: 417 Pine Street. NEW YORK OFFICE: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS.—We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete. Ready for Gas Making. Also,

RETORT HOUSES,

COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE AS OF ST. LOUIS, MO.

Gold Medals awarded by the Louisiana Purchase Exposition at St. Louis, for fireclay gas retorts, gas retort benches, firebrick and setting tiles.

Newbigging's Handbook for Gas Engineers and Managers. Price, $6.50. For Sale by A. M. Callender & Co. 42 Pine St., N. Y. City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully Prepared.
For Gas Making or
Heavy Steaming. .

A. C. M. AZOY, General Agent, 1 Broadway, New York.

JEFFREY

ELEVATING, CONVEYING, POWER TRANSMISSION MACHINERY

CATALOGUES
—ON—
ELEVATING-CONVEYING, No. 72.
RUBBER BELT, No. 67.
COAL AND ROCK DRILLS, No. 76.
MINING MACHINERY, No. 19.
With others sent postpaid on request.

IS IN GENERAL USE IN
MILLS,
MINES,
FACTORIES,
WAREHOUSES,
BREWERIES,
INDUSTRIAL AND POWER PLANTS.

WE HAVE BEEN PERFECTING OUR LINE FOR OVER TWENTY YEARS.

OUR PRICES AND DISCOUNTS ARE RIGHT.

THE JEFFREY MANUFACTURING CO.,
COLUMBUS, OHIO, U. S. A.
New York, Chicago, Boston, St. Louis, Denver.

The Gas Engineer's Pocket-Book,

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

PRICE, $3.50.

For Sale by

A. M. CALLENDER & CO., 42 Pine Street, New York City.

FRED. BREDEL, President. A. A. MOONEY, Vice-President, O. W. GREENSLADE, Secretary and Treasurer.

FRED. BREDEL COMPANY,

ENGINEERS AND BUILDERS OF GAS PLANTS.

Inclined Benches, own system, Recuperative Furnaces, Exhausters, Exhauster Governors, Condensers, Washers, Coolers, Wet Purifying Plants, Purifiers, Oxide Elevators, Hydraulic and Dry Coke Conveyors.

Special High Grade Material for Recuperative Furnaces.

Licensees for ARROLL-FOULIS Charging and Discharging Machines and FRONHAUSER Coke Conveyors. OFFICE, 405 KEENE ST. MILWAUKEE, WIS.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind
Correspondence Solicited

BAXTER & YOUNG,

CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

GAS PROPERTIES PURCHASED.

OFFICE: WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

Geo. Shepard Page's Sons.

GAS MACHINERY.

Correspondence Solicited.
180 Fulton Street, New York City.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Second Edition. Price, $3. For Sale by
A. M. CALLENDER & CO., 42 PINE ST., N.Y. CITY.

EDMUND H. McCULLOUGH, President. H. C. ADAMS, Vice-President. CHAS. F. GODSHALL, Treasurer. HENRY WHARTON, Secretary. C. B. NICHOLS, Assistant Secretary.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

SUN COMPANY,

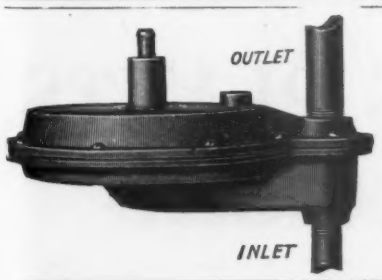
PRODUCER, REFINER, SHIPPER AND EXPORTER OF Petroleum and All Its Products.

Pittsburg, Pa., and Philadelphia, Pa.

THE SUN OIL CO.

Gas Oil, Gas Naphtha,
Refined Oil, Lubricating Oils.

Toledo, O., and Pittsburg, Pa.



REYNOLDS HIGH PRESSURE GAS GOVERNORS.

Our Governors Reduce 30 or 40 Pounds Pressure to 2 Inches Water Pressure.

WE MAKE ALL SIZES OF

DOUBLE DISTRICT GOVERNORS, INDIVIDUAL HOUSE SERVICE AND LOW PRESSURE GOVERNORS.

Write for Catalogue and State what you Need.

JOHNSON-REYNOLDS CO.,
ANDERSON, IND., U. S. A.

Standard Oil Company,

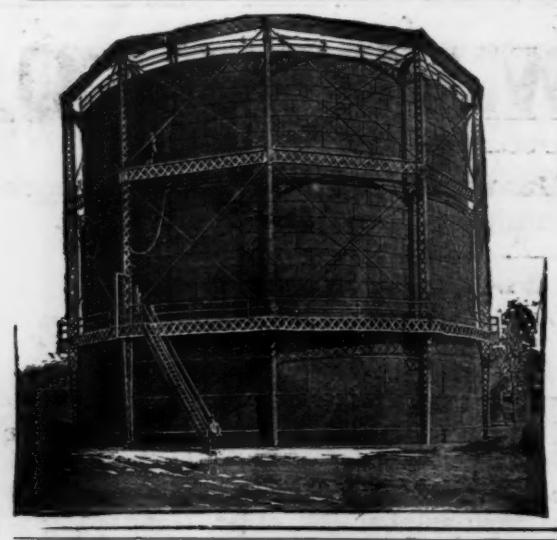
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,

Principal Office and Works, Waltham, Mass.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

FRANK D. MOSES,

Telephone, 1503-D **Telephone, 1503-D**

TRENTON, N. J.,

Constructing Engineer and Contractor.

Estimates Furnished on any kind of Work in Connection with Gas or Water Plants.

SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE

CORRESPONDENCE SOLICITED.

KERR MURRAY MANUFACTURING COMPANY,

Engineers and Manufacturers

APPARATUS FOR COAL GAS PLANTS,

SINGLE AND DOUBLE-LIFT GASHOLDERS AND STEEL TANKS,

Latest Improved

ROTARY EXHAUSTERS, P. & A. TAR EXTRACTORS, AMMONIA WASHERS,

CONDENSING, SCRUBBING AND PURIFYING APPARATUS.

Street Specials and Valves.

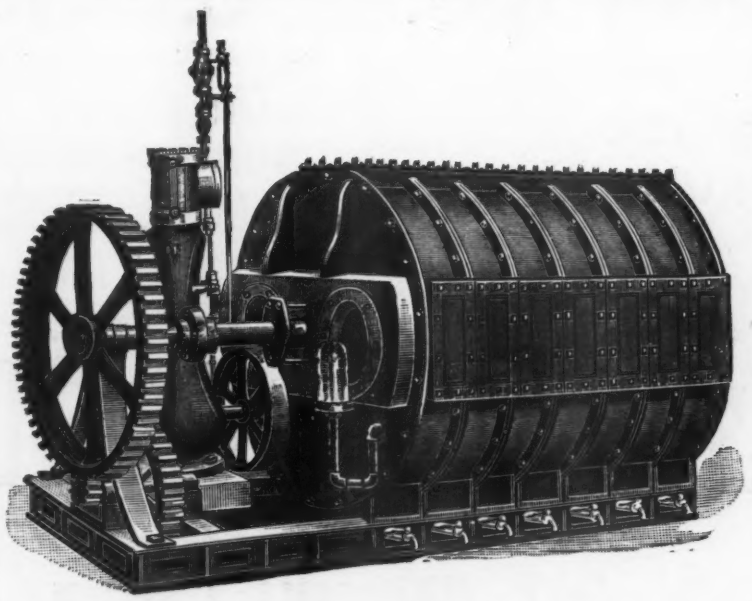
ADDRESS:

KERR MURRAY MANUFACTURING COMPANY, {FORT WAYNE, IND.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Designers and Builders of Gas Works.



Sole Lessees the Wilkinson Water Gas Process.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Disks, thus reducing the weight on shaft and power for operating same.

Coal and Water Gas Installations of the Most Modern and Complete Types.

BENCHES WITH INCLINED RETORTS.

System Stettiner Chamotte Fabrik, Actien Gesellschaft, of Stettin, Germany.

GASHOLDERS OF ALL SIZES.

General Western Agents, THE LLOYD CONSTRUCTION CO., of Detroit, Mich.

QUINTARD IRON WORKS,

N. F. PALMER,

Foot of 12th St. & East River, New York,

MANUFACTURERS OF

GAS APPARATUS.

Complete Works Erected.

FREDERICK W. FLOYD, Engineer.

ALEX. C. HUMPHREYS, M.E., M. Inst. C.E. ARTHUR G. GLASGOW, M.E., M. Inst. C.E.

HUMPHREYS & GLASGOW,

CONSULTING ENGINEERS.

BANK OF COMMERCE BLDG., 31 Nassau Street, New York.

38 VICTORIA STREET, London S.W., England.

ADVICE AS TO EXTENSION AND RECONSTRUCTION OF GAS AND ELECTRICITY PLANT.

COMPLETE EXAMINATIONS MADE.

PROPERTIES PURCHASED.

R. D. WOOD & CO.,

400 CHESTNUT ST., PHILADELPHIA,

MANUFACTURERS OF

Cast Iron Pipe.

HEAVY LOAM CASTINGS,

Dunham Specials,

Hydraulic Work,

LAMP POSTS, VALVES, ETC.,

Gas Power Plants with Producers.

BUILDERS OF

Gasholders.

Single or Multiple Lifts, with or without Metal Tanks.

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

Cutler's Patent Freezing Preventer for Holder Cups.

California Light and Fuel Company,

LICENSED BUILDERS OF

LOWE CRUDE OIL WATER GAS APPARATUS.

GENERAL GAS ENGINEERING.

21 PRESIDIO AVENUE, - - - - - - - - - - SAN FRANCISCO, CAL.

LOWE CRUDE OIL WATER GAS is made exclusively from oil, no solid fuel, such as coal or coke, being used. In localities where oil can be procured at a sufficiently low figure to warrant the use of this gas making method, the results will be ideal, the gas giving a smooth, clear and brilliant light. As ordinarily made it is from 20 to 22-candle power and from 650 to 700 B.T.U. per cubic foot, and about 95 per cent. combustible, no air entering into its composition. The absolute minimum of labor is required, there being no solid fuels to handle. Many plants in units of daily capacities ranging from Sixty Thousand to Four Million cubic feet are in operation. Full information upon request.

Double Gate Valves.

A LARGE STOCK ON HAND READY FOR PROMPT SHIPMENT.

These valves are provided with double discs or gates, and are tight with the gas pressure on either side of them.

The discs are so arranged as to be free from their seats when being opened or closed, and are operated by a quick-acting mechanism. The valve stem extends outside of the bonnet, and serves as an index, showing whether the valve is closed or open, and the amount of opening. They are made of the following dimensions:

Size.	8 Inches.	10 Inches.	12 Inches	16 Inches.	20 Inches.	4 Inches	30 Inches.	36 Inches.
Diameter of flanges.....	13 inches.	16 inches.	18 inches	22½ inches.	27 inches.	3 inches.	3 ¼ inches	44 inches.
Face to face of flange...	12 inches.	12 inches.	12 inches	14 inches	17 inches	20 inches	21 inches.	23½ inches.

For price and other information, apply to

THE CONTINENTAL IRON WORKS,

NEW YORK (BOROUGH OF BROOKLYN).

P. O. STATION G.

Directory of American Gas Companies, 1906.

Price, $5.00.

For Sale by

A. M. Callender & Co., 42 Pine St. N Y.

THE STACEY MANUFACTURING COMPANY,

ENGINEERS FOR THE CONSTRUCTION OF COMPLETE GAS WORKS

GASHOLDERS AND STEEL TANKS

OF ANY SIZE AND DESCRIPTION,

And All Ironwork and Apparatus Required in a Gas Plant.

Also Oil Storage Tanks, Steel Roofs, Valves, Etc.

Makers of Apparatus for THE CHOLLAR PROCESS OF GAS PURIFICATION.

MAIN OFFICE AND WORKS, - - - Station P, Cincinnati, Ohio.
FOUNDRY AND CAST IRON WORKS, 239 Mill St., Cincinnati, Ohio.

RITER-CONLEY COMPANY,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburgh, Pa. EASTERN OFFICE: 111 Broadway, New York City.

WE DON'T CARE WHO MAKES YOUR METERS

It you use the Reeves slot attachments on them. Any good make of meter combined with the Reeves attachment makes the most perfect prepay meter ever manufactured.

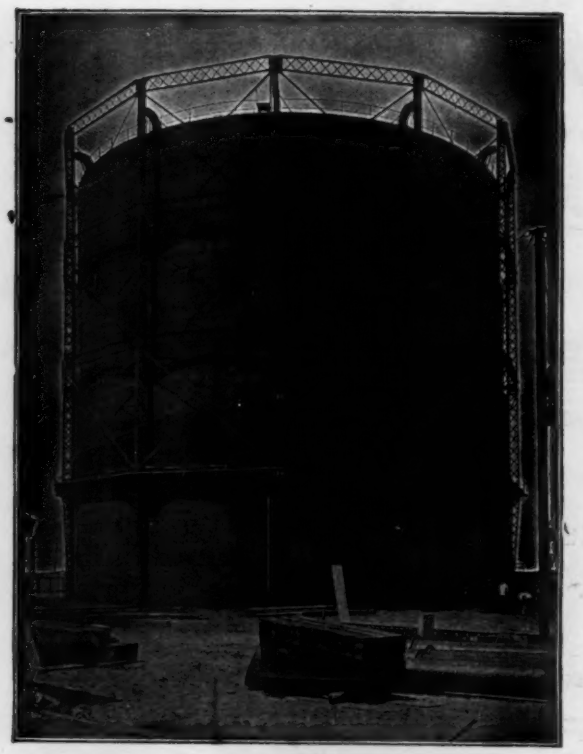
If your meter man does not handle the Reeves attachment we will supply you with the REEVES METER. Large capacity. Other important improvements. Unconditionally guaranteed.

REEVES MFG. CO., New Haven, Conn.

Newbigging's Handbook for Gas Engineers and Managers.

PRICE, $6.50.

A. M. CALLENDER & CO., 42 Pine Street, New York City.



Deily & Fowler,

39 Laurel Street, Philadelphia, Pa.

(ESTABLISHED 1842),

BUILDERS OF

GASHOLDERS,

Single-Lift or Telescopic,

With or Without Steel Tanks.

Oil Storage Tanks, Water Tanks, Etc.

ESTIMATES CHEERFULLY FURNISHED.

CORRESPONDENCE SOLICITED.

The order for this Triple-Lift Holder and Stee Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 cu. ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.,

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete, with Steel Tanks.

BENCHES, SCRUBBERS,
CONDENSERS,
PURIFIERS, IRON ROOFS,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for
Complete Works.

FREDERIC EGNER,
Gas Engineer,
NORFOLK, VA.,

May be consulted with reference to estimates of cost for new, or appraising actual value of existing works; utility of proposed or patented processes; relative earning power to capitalization, and management

ELECTRIC GAS LIGHTING.

How to install electric gas igniting apparatus, including the jump spark and multiple systems for use in houses, churches, theaters, halls, schools, stores or any large building. Also, the care and selection of suitable batteries, wiring and repairs.

By H. S. NORRIE.

Price, 50 Cents. Orders may be sent to

A. M. CALLENDER & CO., - - - 42 PINE STREET, NEW YORK CITY.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 120,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

561 West Forty-seventh Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | Jefferson and Monroe Streets, CHICAGO.

WESTINGHOUSE

DRY GAS METERS

Are adapted to the accurate measurement of

ACETYLENE GAS

Meters are equipped with suitable indexes for this class of service.

Prices quoted upon request

PITTSBURG METER COMPANY

EAST PITTSBURG, PA.

70 PER CENT.

Of Our Output is

PREPAYMENT GAS METERS.

We have fitted up over 16,000 Idle, Regular Meters with our

PREPAYMENT ATTACHMENT.

Can be attached to any make of meter.

NATHANIEL TUFTS METER COMPANY, 8 MEDFORD STREET, BOSTON, MASS.

MARYLAND METER CO.,

BALTIMORE, North and Saratoga Streets. **CHICAGO, 1307 Railway Exchange.**

CONSUMERS' AND STATION METERS, PRESSURE GAUGES, ETC.

SPECIAL ATTENTION GIVEN TO ALL REPAIR WORK.

"Have you Seen our Complaint Meter?"

WHEN YOU SEND REPAIRS TO US

They can be changed to Prepayment, Prepayment and Beal Straight-reading, or Beal Straight-reading only. Good job. Good time. Good people. Write us.

KEYSTONE METER CO., Royersford, Pa.

Prepayment Attachments---Prepayment Meters.

THEY ARE NOW RECOGNIZED, WHEREVER USED, AS ABSOLUTELY THE BEST PREPAYMENT EVER PRODUCED. THEY MET WITH IMMEDIATE SUCCESS FROM THE START, THE DEMAND INCREASING SO RAPIDLY EACH YEAR THAT IT IS ONLY RECENTLY WE HAVE CAUGHT UP WITH OUR ORDERS. WE WISH TO ANNOUNCE THAT WE ARE NOW PREPARED TO MAKE PROMPT SHIPMENTS.

Points of Merit: *A Money Saver, Simplicity in Construction, Accurate and Reliable, Up-to-Date.*

Thousands in use in the Largest Cities in the United States, Giving PERFECT SATISFACTION.

NEW YORK IMPROVED METER CO., *306-310 East 47th St., New York City.*

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Wet and Dry Gas Meters, Station Meters, Meter Provers,
Photometrical Apparatus, Gauges,

PREPAYMENT METERS,

REGULAR METERS REFITTED WITH PREPAYMENT ATTACHMENTS.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

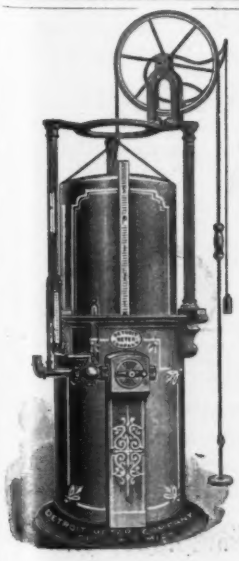
METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.



DETROIT METER COMPANY,

DETROIT, MICH.

GAS METERS. ✻ METER PROVERS. ✻ METER REPAIRING.

The Quality and Weight of our Materials and Excellence of Workmanship enable us to claim for Detroit Meters GREATER DURABILITY, more ACCURATE REGISTRATION and probability of FEWER REPAIRS.

Prompt Shipments guaranteed by Rail or Lake, saving time and freight expense to Western buyers.

We make a specialty of TINNING AND GALVANIZING Cast and Wrought Iron Work for Gas Companies.

SAY, Mr. Gas Man, has it ever occurred to you that limited purifying capacity is a costly investment to your Company?

We build all kinds of purifiers, with either wet or dry seals, and our prices and designs are right.

ESTIMATES AND SPECIFICATIONS PROMPTLY AND CHEERFULLY FURNISHED.

THE WESTERN GAS CONSTRUCTION CO.,

FORT WAYNE, IND.

1707 WALL ST. EXCHANGE BLDG., NEW YORK. 600 SEVENTH ST. SAN FRANCISCO, CAL.